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Railway Transport

Diesel-Electric Locomotives' Role

ALTHOUGH all-out electrification of British main-line railways is among those desirable long-term projects that must be deferred in order to devote the national resources to immediate necessities, that does not rule out conversion at once from steam in appropriate instances, i.e., when it would aid, directly or indirectly, the production of goods for export.

It is of no avail now to harp upon the improvements in transport that would have been so great a national asset if the Weir Report of 1931 had not been pigeon-holed. We need only draw attention again to the evidence from Sweden, as presented at the recent World Power Conference, that great as have been the economic advantages there through main-line electrification, they have been eclipsed by benefits on other counts.

Not "Indiscriminate" Schemes

Minor conversion measures now in hand in Great Britain hardly indicate an "indiscriminate use of resources . . . in railway electrification" as *The Times* has recently suggested. Neither the resumption of the Manchester-Sheffield scheme nor the building of diesel and gas-turbine locomotives embodying electric drives can properly be so regarded. The former project was under way before the war broke out, and the first locomotive underwent trials six years ago. The very necessary increase of 25 per cent in the capacity of this route, along which heavy freight (60 per cent of which is coal) is conveyed against severe gradients and through the three-mile long Woodhead tunnel, can be obtained only by electrification. The saving in coal will be in the nature of a bonus. Use can readily be found elsewhere for the displaced steam locomotives, which moreover have not unlimited working lives and entail heavy maintenance costs as they grow older.

Satisfactory Substitutes

In other areas where traffic is less dense and locomotives have to be renewed or the service speeded up, internal-combustion engines equipped with electrical gearing provide a superior substitute for steam, and developments in this direction are discussed by Mr. Alfred Regnauld on page 446. The merits of this class of prime mover in shunting are now generally accepted, and a ratio of one ton of diesel oil to twelve tons of coal is reported to have been established for the purpose. For general haulage a proportion of four or five to one is probably a fair average.

Whatever the ability of the mines to meet future demands for coal for home industries and export, the high-grade large coal required by steam locomotives could doubtless be profitably diverted to other markets. In that case the far greater overall thermal efficiency of diesel-electric transport would much more than offset any objection on economic grounds to the use of imported fuel. This objection does, however, become valid in drawing comparisons with a full-electrification system, which derives energy from electric power stations fired with low-grade coal for which there is no alternative outlet and which presents such advantages as high overload

capacity, better acceleration and avoidance of fumes in tunnels. The oil-electric system, therefore, seems likely to provide an appropriate means of transition from ancient to modern railway practice. Within the fifteen years allowed by the Weir Committee the oil engines remaining in commission could be successively transferred to parts of the system that were still without overhead equipment. As soon as national circumstances permit, the data given in the Weir Report should be reviewed in the light of capital, labour and fuel costs then prevailing with the intention of putting in hand a comprehensive scheme of main-line electrification providing for the use of oil- and gas-electric propulsion during the building-up process.

Labour Control

THE Control of Engagement Order restores to industry generally a wartime system from which the coalmining, agricultural and building industries have never been relieved. It is recognized as a necessity but it is still regrettable. There is, moreover, some doubt as to whether it will achieve its purpose for it will only affect people seeking employment, not those already in occupations which do nothing towards national recovery. It seems to be the idea to create unemployment in non-essential industries by refusing them raw materials but this will hardly affect non-productive employment. The effect of the Order upon the electrical industry should, if anything, be advantageous, for the flow of labour should be towards and not away from it.

Too Much Power?

IN a letter published in *The Times* of September 22nd, the director-general of the Federation of British Industries, Sir Norman Kipping, questioned whether it was likely that the demand for electric power would keep pace with the projected power plant extensions. He maintained that cuts in development and re-equipment programmes meant a deferment of the demand for more electric power and wondered what proportion of the current growth in the demand would disappear if there were not a shortage of solid fuel. We are sure that the Central Electricity Board, from whom Sir Norman Kipping requests an assurance, has not overestimated the requirements. Past experience has shown that estimates, if anything, have been too timid. A large part of the projected plant is designed to meet a position which already exists and although industrial demand may be re-orientated it is safe to say that it will not diminish.

House Warming

EXPERIMENTS described on a later page, which are being carried out by the Building Research Station with the object of reducing heat losses through roofs and walls and by draughts, become of especial importance when a refined source of heat is used, such as electricity, which lends itself to easy control to suit individual needs. The other major cause of waste, chimneys, does not enter into the equation with electrical methods. The aim of the investigation is to secure adequate warmth with least fuel consumption. Mere quantity will not, however, provide a true criterion. That should be based upon the comparative value of coal were it used for other purposes—a value that approaches zero in the case of electricity but is high for domestic fires and gas-making.

Street Lighting Outlook

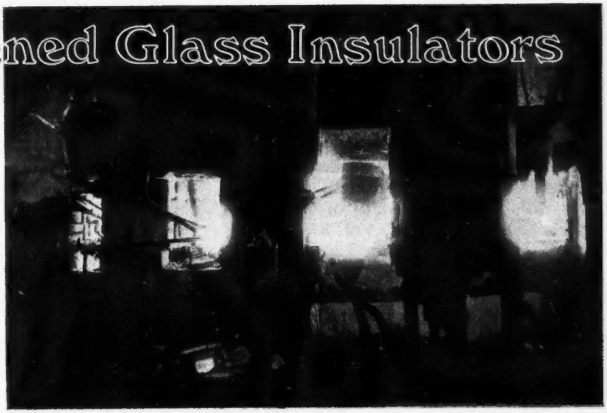
THERE is no doubt, as several of the speakers at last week's conference of the Association of Public Lighting Engineers pointed out, that the attitude towards street lighting has undergone a great change since the war. To regard it as a luxury which can be dispensed with at the slightest provocation has become commonplace and a good many obstacles will have to be overcome before it assumes its rightful place among public services. Probably no single factor has a greater effect on the reduction of night road accidents and crime than street lighting. Restoration to full pre-war standard would mean only about 1 per cent more fuel.

E.I.B.A. Ball

ALTHOUGH austerity is enjoined upon us there is good reason for the decision of the Electrical Industries Benevolent Association to carry on with the arrangements for the annual Ball on November 14th. The Association is hoping that, as in previous years, large-hearted well-wishers will provide prizes. Tickets are 30s. (including a buffet supper) and should be applied for quickly as the supply is usually smaller than the demand. The address is 32, Old Burlington Street, W.1.

Toughened Glass Insulators

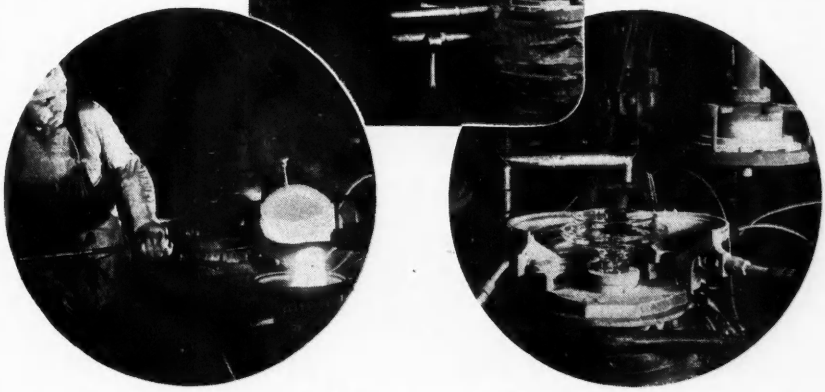
Production and Testing Processes



The " metal " is drawn from the regenerative furnace by hand ladles

BY the courtesy of Pilkington Brothers, Ltd., we are able in this article to describe the processes employed in the production of toughened glass insulators as we saw them carried out recently at the company's works at St. Helens, where complete ranges of pin-type insulators for voltages from 6·6 kV up to 33 kV, and disc-type insulators for power lines of any voltage, with mechanical strengths of up to 60,000 lb, are produced. These products account for the bulk of the manufacture, but a range of third-rail insulators for railway electrification has been developed in conjunction with the L.M.S. Railway.

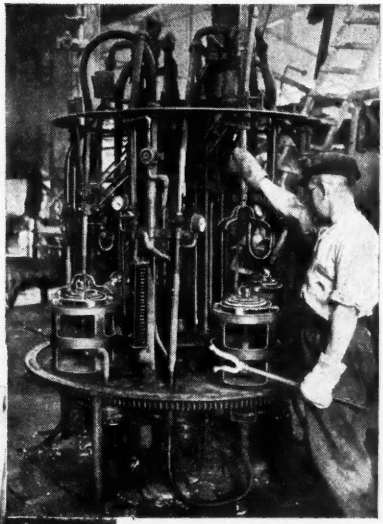
There have been many attempts in the past to manufacture power-line insulators of glass, because of the excellent electrical properties of this material, but they failed, or achieved only



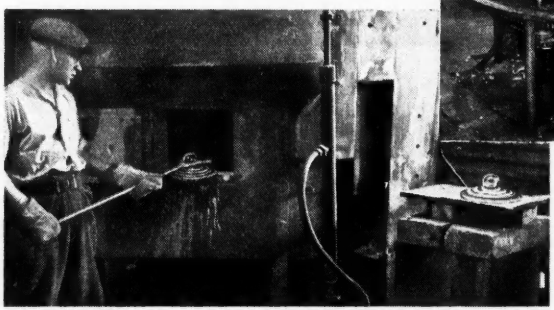
The " metal " is poured into a cast-iron mould in a hand press, the tool having a stationary lower portion for the outside contour and a plunger portion for the inside contour

limited success, owing to the inherent thermal or mechanical weaknesses of ordinary glass. The situation changed, however, when a process by which shaped glass articles could be toughened or pre-stressed was developed and immediately applied to the production of power-line insulators.

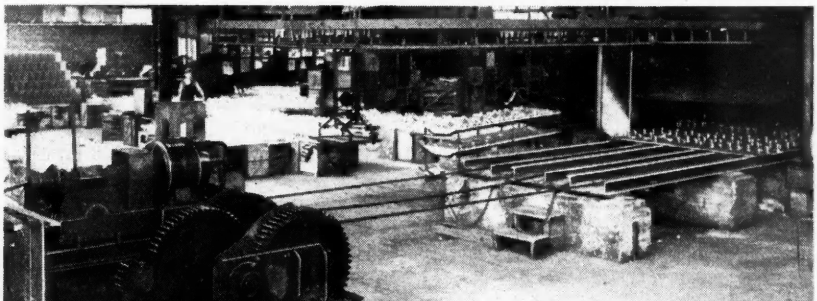
To quote from the paper, " The Development of a Pre-stressed (Toughened) Glass Insulator," presented by Mr. P. M. Hogg, B.Sc., to the Institution of Electrical Engineers—I.E.E. *Journal*, Vol. 87, No. 528 —" Pre-stressed or toughened glass is glass which has been so treated after manufacture as to produce intentionally a strain distribution in which the surface layers are in a state of high compression. The process of pre-stressing consists of heating the glass to a uniform temperature considerably above its strain temperature, and then cooling it rapidly, usually by blowing air on all its surfaces under carefully controlled conditions. The resulting strain distribution greatly increases the resistance to mechanical and thermal shock. The interior of toughened glass is in a state of tension, and the rate of cooling must be so adjusted that the maximum tension in the central layer does not exceed a safe value. The process is limited to



On the toughening heads air-pipes direct chilling air on to all the insulator surfaces



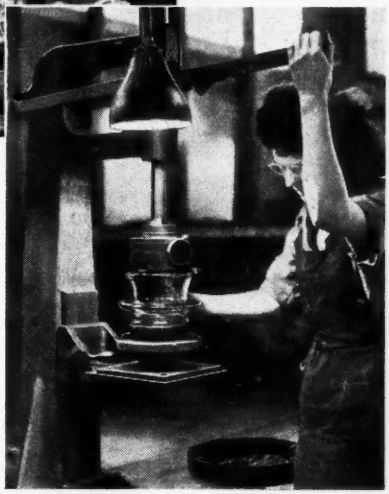
Immediately after casting the glass piece is transferred to the equalizing furnace



The second thermal shock takes place in a lehr through which the trays of insulators are drawn step by step by a winch

comparatively simple shapes in which a satisfactory strain distribution can be obtained."

Pre-stressing does not change or modify the insulating properties of the material; it merely improves the mechanical and thermal properties. The surface compression will effectively prevent the formation with time of any surface cracks at stressed surfaces, and the life of the insulator will, therefore, be the life of the metal fittings with which it is assembled. Strain in transparent glass can be measured by means of polarized light because the velocity of light in glass (and therefore the refractive index) depends on the average distance between the atom groups, and this varies with the strain. A convenient optical system for measuring strain is housed in the laboratory in the form of a Babinet compensator. This instrument projects an image on to a screen from which numerical values of the strain can be directly determined.



Presses for assembling the pins are equipped with a range of jigs and chucks

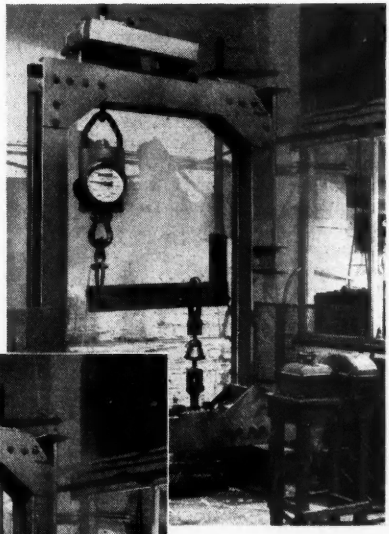
The principal raw materials employed for the production of the glass are sand, limestone and soda ash, with traces of other materials. In their correct proportions these ingredients are introduced into a continuously working oil-fired regenerative tank furnace. The molten glass temperature at the filling end is 1,500 deg C, and at the working end where the molten glass ("metal") is drawn off for processing the temperature is 1,200 deg C. The " metal " is drawn off by hand ladles from a port in the working end of the furnace and poured into a cast-iron mould contained in a hand-operated pressing machine. A plunger of the same material is then brought down and the glass is thus pressed into the required shape.

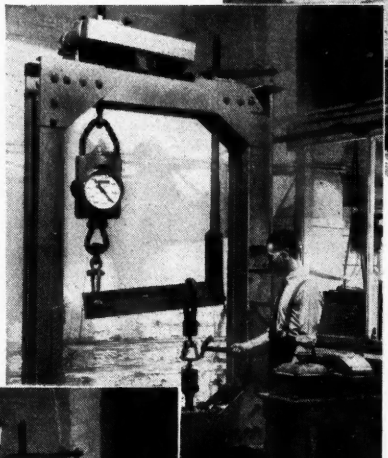
Immediately after this operation the mould is opened out and the glass insulator pressing is transferred to the equalizing furnace. This is a thermostatically controlled electrically heated rotating-hearth furnace operating at about 710 deg C. The object of this furnace is to equalize the temperature throughout the glass pieces and so afford a uniform distribution of the toughening stresses. The equalizing furnace is a resistance equipment with a vertical cylindrical container. It is about 5 ft in diameter and 4 ft deep, and the elements are disposed on the roof, round the interior of the wall and under the hearth. The total loading of the furnace is 30 kW, and the elements are arranged and supplied in one bank.

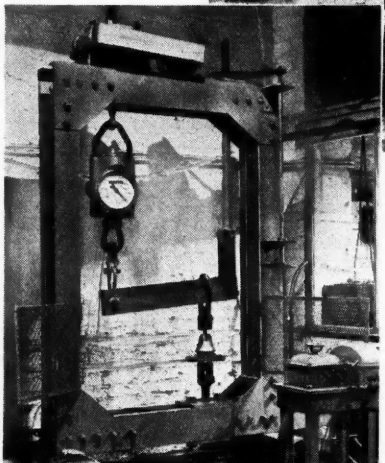
The furnace supply transformers are tapped for effecting a primary regulation of the heating conditions, but the final control is left to the thermostat. The hearth is motor driven, and the transmission gear is such as to give a hearth speed of one revolution in six minutes. The uniformity of temperature so imparted to it renders the insulator ready for the toughening process which is carried out on a machine specially designed for the purpose. This

circular machine carries four toughening heads, each consisting of a motor-driven revolving table to carry the insulator, with stationary air pipes to direct chilling air on to all the insulator surfaces. The rotation of the cradle is automatically started and the air is automatically turned on when the air pipes are pulled down into their working position, i.e., with their jets near the surfaces of the insulator after it has been placed on the cradle. The insulator shell is now complete except for testing and the assembly of the component parts of glass and metal.

In view of the absolute necessity of ensuring a correctly toughened glass, two thermal shock tests are carried out immediately after the toughening process. The first or hot-to-cold thermal shock consists of plunging the insulator, which has been heated to 130/140 deg C, into a tank of cold water at 20 deg C. This ensures that the compression stress produced in the outer layers by toughening is above a certain minimum which itself is higher than any forces which it will meet in service. The insulator is heated to the temperature named (130/140 deg C) in a rotary-hearth gas-fired furnace, but it should be realized that the insulator is already at a temperature of about 100 deg C, by virtue of the heat which remains upon the conclusion of the toughening process.





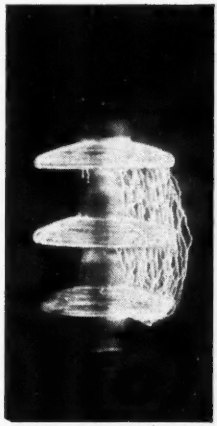


At 20,000 lb the glass was broken, but the insulator still held, and it continued to hold when the load was further increased to 40,000 lb

The second thermal shock or slow-heat test consists in passing the insulators step by step down a lehr through a zone of progressively increasing temperature in such a way that the insulators are subjected to a series of rapidly rising temperatures or upward thermal shocks. The effect of each of these shocks is to increase momentarily the value of the toughening tension in the insulator and so to ensure that its value is within safe limits. A useful feature of both of these thermal shock tests is that rejection is automatic, because the failure of a glass to withstand either of the tests results in shattering.

In the gas-fired lehr employed for the second shock test are cast-iron pans on to which the glasses are loaded and which are drawn through the lehr by a 5-h.p., 460-r.p.m. motor-driven external winch with worm and pinion gear transmission which is arranged to give a haulage speed of only a few feet per minute.

The trays go into the lehr at the rate of one tray depth every half hour. The heating chamber is about 10 ft wide, 2 ft high and 36 ft long. Each tray is about 3 ft square and will hold about nine 10-in. insulator sheds, so that every insulator is in the heated portion of the furnace for six hours. The remainder of the length of the lehr is the cooling zone in which the glasses are brought back to atmospheric temperature. The glasses are now ready for assembly with the other component insulator parts. The presses used for this purpose are equipped with a range of jigs and chucks by which the individual sheds of a multi-piece pin-type insulator can be built up or the caps or pins of a disc-type insulator can be secured to the glass. The cement used in every case is of the aluminous variety, and each joint is water cured, i.e., the cement is covered with water in a special bath for a period of 24 hours immediately after assembly and before the next joint or fitting is assembled.



Dry flash-over at 202 kV on a string of three standard 10,000-lb units, without arcing fittings

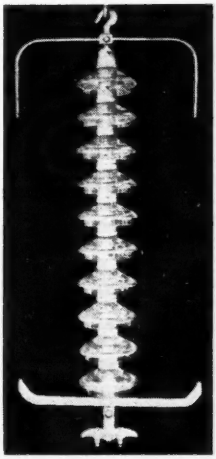
Mechanical Load Tests

It has been found that water curing increases the cement strength by some 30 per cent above the strength which would be obtained if the cement were allowed to set in air. After removal from the water bath the insulators are cleaned by a simple buffing operation, and in the case of the disc-type units they are subjected to a routine mechanical load test.

The routine mechanical test loads are shown in the following table:—

Routine test load, lb	Guaranteed electro-mechanical strength, lb
8,000	10,000
16,000	20,000
24,000	30,000
48,000	60,000

Routine electrical tests are unnecessary and are not specified in B.S.S. 137/1941 because the glass is toughened to a degree which results in a dicing fracture, i.e., the glass shatters completely into small fragments when it is ruptured by electrical, mechanical or thermal means. From this it follows that a toughened glass piece cannot be flawed and remain whole.



A typical 132-kV suspension string with anti-fog toughened glass insulators

After completion of the routine mechanical test the insulator is ready for dispatch. Sample or type tests are carried out, however, in accordance with B.S.S. 137, and they consist briefly of subjecting half the sample insulators, after they have undergone the thermal-cycle test, to a mechanical load test equal to the guaranteed value and thereafter subjecting the same insulators to the oil-immersed puncture test. The other half of the sample insulators are given mechanical load tests to destruction. The medium used for the oil-puncture test is a lignite oil tar to which 2½ per cent of cable-box compound has been added.*

The addition of the compound renders the oil semi-conducting, and so reduces the electrical stress concentrations set up when the voltage is applied, as compared with transformer oil, thus enabling more consistent and reliable results to be obtained. For carrying out design tests on individual

* R. Van Canwenberghe: "Electro-mechanical and Thermal Stresses in Insulators," *Revue Générale de l'Electricité*, 1938, 44, p. 633.

units and on insulator strings for up to 66 kV working voltages a 17-kVA, 250-kV testing transformer is employed. Other facilities are available when voltages in excess of 250 kV are required. Impulse testing and 50-cycle testing at voltages above 250 kV are usually carried out by the Research Department of the Metropolitan - Vickers Electrical Co., Ltd.

We saw a dry flash-over at 202 kV on a string of three standard 10,000-lb disc insulators, without arcing fittings. Reference has been made to the fact that the insulator glass shatters completely if it is ruptured, but the design of both pin-type and disc-type insulators is such that the insulator will pass through the B.S.S. load tests after the glass has been shattered; thus the supply line will not be let down if the insulator fails in service. To demonstrate this point to us an insulator was loaded to 20,000 lb, at which load the glass was broken by a heavy hammer blow, but the insulator still held. The load was then increased to 40,000 lb. and still the insulator held.

As the glass shatters in this way if it is faulty it will be appreciated that the location of the faulty insulator in service is merely a matter of visual inspection from the ground. If the glass is there the insulator must be electrically perfect, so that live insulator testing on high-voltage strings can be eliminated.

We are indebted to Mr. E. F. Johnston, of the Pilkington Insulator Department, for help in preparing this article.

Diesel-Electric Locomotives

High-Speed Engines for Main-Line Traffic

By Alfred Regnauld,
B.Sc. (Eng., Lond.), A.R.C.Sc., M.I.E.E.

RECENTLY announced decisions by the railway companies in this country to use diesel-electric locomotives for the haulage of high-speed, long-distance passenger trains may, to a certain extent, have been prompted by the continuing shortage and high price of coal. Already steps had been taken to convert a number of steam locomotives on each of the four big railway systems from coal to oil burning and, it has no doubt been argued: Why use oil as fuel for the steam engine when by the use of the internal-combustion engine a far higher efficiency can be obtained? In order to obtain the necessary degree of reliability the diesel engine will, no doubt, be supplied with a superior grade of oil to that usually burned in the furnace of a locomotive boiler, i.e., diesel oil in place of fuel oil, but even so, this will be thoroughly worth while in view of the far higher efficiency and the greater calorific value.

Another and probably more weighty factor governing this decision is the undoubted success which has attended the use in this country of the diesel-electric shunting locomotive. Careful analyses have shown that when every factor is taken into consideration including capital cost, fuel and lubricating oil, maintenance and repairs, the overall cost of operation is undoubtedly in favour of the diesel-electric locomotive as compared with its steam counterpart. Moreover, while our railway engineers have apparently been slow to recognize the advantages of the diesel-electric system as applied to main-line operation, they cannot be unaware of its increasing use both on the Continent of Europe and in America; indeed, it has recently been stated that no less than 12·2 per cent of the passenger train mileage in the United States was, at the end of 1946, worked by diesel-electric locomotives.

This is all the more remarkable when it is remembered that the cost of the diesel-electric locomotive is considerably higher than that of the steam locomotive of the same power, this being very largely due to the cost of the electrical equipment. Considered merely as a system of power transmission between the engine and the driving wheels of the locomotive, the electric gear is far more expensive and rather less efficient than the equivalent mechanical toothed gear, but it is far more flexible and even where relatively low powers are required —as in the shunting locomotive—the electric transmission system is now generally preferred. With high powers, the use of a mechanical clutch together with a speed reduction and reversing gear can be ruled out.

There remains for consideration one serious factor which has hitherto militated against the use of the high-powered diesel-

electric locomotive and that is its weight. In the announcement of the adoption of the diesel-electric system, the statement was made that for hauling express trains of 500 tons at a maximum speed of 100 m.p.h., two 1,600-b.h.p. locomotives would be used. To the British steam locomotive engineer the adoption of " double-heading " is anathema, and he has always endeavoured to design his locomotives of such power that they can haul the heaviest passenger trains at high speed over any part of the system. The maximum power developed by a modern express steam locomotive is considerably in excess of 1,600 h.p., and double-heading is seldom employed, but a study of current United States practice reveals that the railway engineer there has no inhibitions against double- or even treble-heading, and the now-famous diesel-electric " flyers " usually have two or even three locomotives, all controlled from the front cab of the first unit. This policy is dictated by the problem of weight

Dual System

Particulars already made available of the new Southern Railway diesel-electric passenger locomotives show that these will be provided with a 1,600-h.p. diesel generator supplying current to six axle-hung traction motors mounted on two six-wheeled bogies. The locomotives will be 62 ft long and weigh 120 tons, which approximates to the standard maximum load permitted on the average British main-line track of about 20 tons per axle, the arrangement of electrical equipment corresponding with that on the CC all-electric locomotives already in service on the Southern Railway. These take their current from the third rail, and the question at once suggests itself as to whether the new diesel-electric locomotives will be provided with current pick-up gear so that they can use the existing supply where it is available, the diesel generators being put into operation when working on those parts of the system which have not been electrified. This arrangement is already being extensively employed in America, and it is known that a delegation from the Southern Railway has studied methods adopted in that country.

It should be emphasized that the weight of the equipment of the diesel-electric locomotive is kept down to the minimum by the adoption of special high-speed light-weight engines but, judging from practice abroad, an increasing power-weight ratio should still be possible, permitting the use of higher powers in a single locomotive. Thus, on the New York–Miami run, romantically termed the " Orange Blossom Special," three locomotives are employed yielding a total of 7,800 b.h.p. or 2,600 b.h.p. per locomotive, made up of two 1,000-b.h.p. engines and a 600-b.h.p. auxiliary unit. On the Continent, single locomotives have been built giving 4,400 h.p. produced by two 24-cylinder engines each developing 2,200 b.h.p.

Gas-Turbine Possibilities

A further development in the saving of weight may be expected when the gas turbine replaces the reciprocating diesel engine. Thus, it has already been announced that the Great Western Railway's gas turbine-electric locomotive will have a turbine developing 2,600 effective horse-power, and that the current will be supplied to six driving motors, the locomotive also being of the CC type weighing 120 tons.

The problem of weight per axle having been satisfactorily solved, the well-proved advantages of the diesel-electric system become immediately available. Chief among these, apart from the efficiency in fuel consumption, is the greater availability which permits of a locomotive being used continuously, if necessary, 24 hours per day for six days per week as is the general practice with existing diesel-electric shunting locomotives. The lay-off time is thus reduced to a minimum, and since the diesel engine can be readily started and stopped, there are no stand-by losses when the locomotive is in service but stationary. Again, the locomotive can be driven from either end so that no turntables are required, the distance to which the locomotive can operate being limited only by the amount of fuel and water it can carry, which—particularly as regards water which is used in the engine cooling system and cooled for re-use in the radiator—are both of them much less than that required for a steam locomotive of the same power.

If the expectations of the designers of these locomotives are fulfilled and, judging from their success elsewhere, there is no reason why they should not be, there should be gradually opened up yet another extensive field for products of the electrical industry.

" Enterprise Scotland 1947 "

It is announced that the " Enterprise Scotland " Exhibition will not close at the end of September as intended, but will continue till the middle of October and possibly longer.

Views on the News

Reflections on Current Topics

BRADFORD, which last week commemorated, belatedly, fifty years of electricity supply in the town, can point to a notable record of pioneering activities. In addition to its claim to be the first local authority in Great Britain to supply electricity for general purposes and to bring carbon lamps at over 200 V into use on a large scale (1897), it was among the earliest to charge a penny rate for power (1898) and to introduce a motor-hire scheme. Later it was the first undertaking to institute a "point-five" charge for domestic purposes on a rateable value system. Comparatively recently (1930) came the installation of superimposed plant with steam conditions of 1,000 lb per sq in. and 800 deg F, the 2,500-kW turbine of which exhausts, via a reheater, into the 200-lb range supplying the undertaking. During the twelve months ended March 31st last, Valley power station, now extended, generated 308 million kWh and met a city demand of 81,670 kW with a coal consumption of 1·49 lb per kWh.

* * *

Early hopes entertained by the general public that atomic fission would soon solve problems of power shortage receive decreasing encouragement as the technical difficulties of large-scale working become more apparent. It is anybody's guess whether Professor J. T. Cockroft, who considers that "breeding"—a vital factor in bulk production of heat from nuclear energy—is as yet only an interesting possibility, presents a more promising outlook than does Professor M. H. L. Pryce, who expects that we must be content to wait for a good part of a century for a significant contribution from this quarter. The obvious inference is that we should in the meantime develop existing resources to the utmost.

* * *

One would have thought that after the wartime darkness people would have insisted on as much light as possible. But it is typical of the submissive state of mind which now afflicts our people that a little extra light actually calls forth vigorous protests. The chairman of the North Walsham (Norfolk) U.D.C. recently said that although full street lighting had been resumed in the district the consumption of electricity was actually below half the pre-war consumption prescribed by the Government. Whereupon an indignant correspondent to the *Eastern Daily Press* says that "things have come to a pretty pass if we comply strictly to the letter of the law" and demands that "if the lighting can be reduced even below the Ministry's standard then reduce it." This is kissing the rod with a vengeance.

* * *

A control unit embodying a socket for a kettle or iron is really an essential part of a cooker installation and it is reasonable to consider its cost a part of the cost of the cooker. Indeed if it is not there is a danger of would-be users declining to have an electric cooker. This has been realized at Nottingham where an attempt was made to get the consumer to pay separately (as much as 50s.) for a control unit installed with a hired cooker. As a result of protests it has now been decided to raise the quarterly charge to cover the unit. I was under the impression that the hire charge for a cooker generally included the cost of installation, but apparently this is not invariably the case.

* * *

In the early days of the war there were repeated warnings about the dangers attendant upon the installation by novices of electric lighting or heating in Anderson shelters. A number of fatalities proved that the conditions were most deadly. Now, over two years after the end of the war, the danger has not been removed, for I see that in the Glasgow area a week or two ago a man was killed while repairing a wire running from a house to a shelter. There seems to be a need for a further warning by supply authorities in areas in which Anderson shelters are still in use.

* * *

The Central European inventor is getting into his stride again. It is reported by the *Daily Express* that an Austrian says he has developed an electrical ray which makes a man invisible. This is probably an improvement upon the Wellsian chemical method. —

REFLECTOR.

Railway Goods Charges

Methods of Minimizing Costs

By Graham Saville

ON October 1st railway goods charges will be increased by 24 per cent, raising them to 55 per cent above the pre-war level. The increase makes it imperative that all electrical concerns should make certain that they are obtaining the lowest possible rates and availing themselves of all rebates and concessions. To do this it is necessary to have at least some knowledge of the structure of railway goods charges, particularly in respect of exceptional rates.

All traffics are grouped into twenty-one classes, of which class 1 is the lowest and class 21 the highest. Details of the classification of any particular traffic can be found in the Railway Clearing House publication "General Classification of Merchandise." As examples of the classification of one or two types of electrical traffic I may quote:—Electrical accessories, adaptors, bell pushes, ceiling roses, connecting boxes, cut-outs, fuses, lamp sockets and switches, all in class 18. Electrical regulating resistances (except motor-starting switches) are classified as follows:—5 tons, 12b; 2 tons, 14b; and less than 2 tons, 16b, if not in cases, as damageable goods not properly protected by packing. (Exceptional rates for list P apply). H.v. switchgear, consisting of switches without instruments or meters other than ammeters, enclosed in heavy iron or steel casing is in the following classes, 5 tons, 12; 2 tons, 14; less than 2 tons, 16.

Weight Minima

Whilst electrical concerns will find that the majority of traffics in which they are interested are highly classified they should be aware that with the lower classes weight minima are in operation and dispatching programmes should be so arranged as to take advantage of the lower classes for large tonnages. This automatic reduction in classification for high tonnages also applies to many types of traffic bearing high classifications. This will be seen from the illustration given above in respect of switchgear, where the classification varies from class 12 for 5-ton lots to class 16 for lots of less than 2 tons.

In order to obtain the benefit of reduced rates for lower classified traffics when more than one consignment is forwarded to different consignees at the same destination point, it is necessary to consign the merchandise "part lot." The regulations concerning this method of consigning are set out in the "General Classification of Merchandise" and read as follows:—

(1) The consignments are consigned to be charged together. (2) The whole of the consignments are handed to the railway company on one day. (3) The charges are paid by the sender or by special arrangement with the railway companies by the consignee. (4) When a consignment is split at destination into different portions, not exceeding 3 cwt each, 1d. per portion will be charged for the service. (5) Consignments so amalgamated, when collected from more than one address (whether conveyed at station-to-station rates or at rates which include collection) are subject to separate collection charges and when delivered to more than one address are subject to split delivery charges.

Exceptional Rates

Although considerable savings can be made by taking advantage of these reductions in standard rates for high tonnages and by the elimination of the small parcels premiums by part lotting, the principal method of effecting economy in railway goods charges is by obtaining exceptional rates. These are generally quoted because there is a considerable tonnage of traffic passing between particular points, or for some special reason such as combating road competition. Exceptional goods rates are sometimes quoted for an individual traffic or traffics, and on other occasions for lists of traffics.

Several of these lists will be of interest to electrical firms, as lists K, L, M and N cover iron and steel and list P machinery. Included in list P are electric arc welding plant; electrical apparatus for lighting or power, viz.:—regulating resistances (except motor-starting switches); kiosks, iron or steel, fitted with heavy electrical apparatus, without instruments or meters; switch boxes or fuse boxes, iron or steel, without electrical fittings; switchgear, high voltage, consisting of switches without instruments or meters, other than ammeters, enclosed in heavy iron

or steel casing; alternators, condensers, dynamos, field pieces and housings, iron or steel, for generators, whole or in sections, finished, without windings; field pole pieces, iron or steel; and generators.

Exceptional rates are quoted for various tonnages, depending on the type of traffic. With electrical items very common quantities are 2-ton and 4-ton lots. A particular type of exceptional rate operates between non-competitive stations of the Southern Railway.

Details of these rates are contained in a publication known as the "Exceptional Tariff" which indicates the traffics to which these rates apply and also sets out details of the scales and the various mileage charges in respect of these traffics.

Many exceptional rates are quoted for traffics passing in particular circumstances, i.e., with either collection and/or delivery being performed by the railway company. It often happens, however, that the traffic to which the rate is applied has not been carried under such circumstances and the trader is then entitled to a refund. In the majority of circumstances these refunds are not automatically made and the trader has to apply for them. As the cartage scales are quite high, these refunds can amount to considerable sums.

Refunds and Rebates

Details of the basis of the cartage rebates can in some instances be obtained from the individual stations dealing with the traffic, but these often have no knowledge of the cartage scales applying to other stations. Particulars, however, of exceptional cartage scales can be found in the Railway Clearing House publication known as the "Mauve Pamphlet." This publication sets out the classification of the exceptional lists already referred to, as in normal conditions these have no particular classification number. It then gives details of the scale numbers against each station and finally sets out the cartage element applying to such scales.

There are various other forms of rebate, including a special allowance in respect of traffics in classes 7 to 21 charged at standard rates when conveyed in full truck-loads in open wagons and when no sheet is provided. Details of these deductions are set out in the "General Classification of Merchandise." With firms operating their own private sidings special allowances are often made in respect of the difference between the cost of the portion of the station and service terminals not performed by the railway company and the cost of any particular services performed in respect of the private siding.

In the illustrations of classification given earlier in the article it will be seen that some of the items bear a small letter after the number of the classification. This indicates that such traffics will be carried under owner's risk conditions if the trader so desires. Under such conditions the trader accepts a considerable proportion of the responsibility for liability. To compensate for this the railway company allows a percentage reduction from the rates ranging from "a," 2½ per cent to "h," 12½ per cent.

There are also several special concessions which traders can claim in particular circumstances such as goods which are being returned and articles which have been damaged in transit. Details of most of these concessions are to be found in the Railway Clearing House publication "Special Instructions relating to Goods, Mineral and Livestock Traffic." The nature of such concessions can be understood from the allowances for returned traffic, which are half carriage charges on the return journey provided the traffic is returned between the same points and by the same route. The reasons necessitating the return of the traffic must be one of the following:—(*a*) Articles wrongly sent by consignor, and returned. (*b*) Articles found not to be of the quality ordered, and returned. (*c*) Articles sent on approval, and returned. (*d*) Articles sent for demonstration purposes, and returned. (*e*) Articles returned from warehouses or showrooms at the end of the season. (*f*) Articles sent for hire, and returned. (*g*) Contractors' tools, tackle and appliances, sent to contractors, and returned.

Finally, there are certain special charging arrangements in operation which are of particular concern to larger firms. The most important of these is the railway agreed charge, which is in effect an exceptional rate. Under an agreed charge arrangement the trader pays a flat rate per ton, per package or other unit for the whole or some particular portion of his traffic.

Turkish Import Regulations

Licences for imports into Turkey are now being granted in the case of the following items:—Lamps and parts of lamps, miners' electric lamps, pocket lamps, electric irons, battery cases, foot warmers, other household utensils worked by electricity, electric sockets and amplifiers (of 10 W power or more).

Electrodeposition Practice

International Conference in London

THE Third International Conference on Electrodeposition, organized by the Electrodepositors' Technical Society, was held in London on September 17th and 18th (previous conferences were held in London in 1937 and in the United States some five years later). Twenty-four papers were presented, eleven by authors from Great Britain and others from Australia (2), Canada, France (2), Holland (3), India, Italy (2) and the United States (2); more than half the overseas authors were at the conference in person. Of some 250 members and visitors attending, forty came from abroad and included representatives from Belgium, Egypt, Finland, France, Holland, India, Italy, Pakistan, Spain, Sweden, Switzerland and the United States.

The opening ceremony was performed by SIR ROBERT PICKARD, D.SC., F.R.S., past-president of the Society of Chemical Industry. Then DR. S. WERNICK (president, E.T.S.) formally handed over the Society's Gold Medal (the E.T.S. Medal) to its first recipient, Mr. Samuel Field, A.R.C.S., author and teacher on electrodeposition and the first president of the E.T.S.

Electrolytic Polishing

The first technical session, under the chairmanship of DR. S. WERNICK, was devoted to several papers on the electrolytic polishing of metals, and was opened by DR. P. A. JACQUET, of France, the originator of the theory and practice of electro-polishing who reviewed laboratory applications particularly as applied to research investigations on the properties of metallic surfaces. He was followed by MONSIEUR R. E. HALUT whose paper dealt with industrial applications especially those of polishing stainless steel and electrolytic superfinishing of internal combustion engine components. At the end of the paper he told of Dr. Jacquet's discovery of the process which arose from a search for a method of obtaining polished nickel grids for radio valves, which were not contaminated with grease or other foreign matter associated with mechanical polishing. The process has more recently been applied to copper components to suppress undesirable cold emission from their surface at negative potential in high vacuum and also to tantalum components for discharge apparatus and amplification valves which are very costly to polish by mechanical means.

M. Halut also gave details in his paper of the causes of the disastrous explosion of a perchloric acid electro-polishing bath at Los Angeles in February last and explained that the bath was considerably different in composition from the recommended perchloric-acetic acid solution and that it had been installed by an unqualified chemist who had not taken the precautions advised to keep the bath cool and free from organic impurities.

In a paper on "Special Applications of Electro-polishing" MESSRS. DE DECKER, KRIJFF and PLUUT, of the Dutch Central Institute for Testing Materials, dealt with various methods of metallographic examination. They were followed by MR. P. BERGER who described a method of electro-polishing in commercial use for mass production treatment of small brass pressings before bright nickel plating. The final paper of the session was by MR. E. FARMER on "Movement Study and Training in Metal Polishing" and dealt with mechanical polishing methods.

There was time at the end of the session for discussion, during which DR. G. E. GARDAM suggested that local variations in temperature in the diffusion layer at the metal surface during electrolytic treatment could easily account for the localizing of the anodic action which would assist greatly in levelling down the high spots.

PROF. R. S. HUTTON, M.A., D.SC. (past-president of the E.T.S.) was chairman for the second session which was devoted to miscellaneous processes and reports. MR. A. W WALLBANK read a paper on "German Electroplating Practice" which described results of visits to German factories at the end of the war by intelligence parties under Government auspices, and DR. W. F. COXON described a visitor's impressions of "Continental Plating Trends." In the course of the discussion SENOR J. AGULLO (Spain) briefly described the present position of the plating industry in Spain and referred in particular to a number of plants for hard chromium plating which had recently been installed in his country.

Plating Technique

The third technical session, at which DR. G. E. GARDAM (the president elect) took the chair, contained a series of papers on electrodeposition processes. In the first paper DR. P. BAEYENS of Holland described "The Effect of Operating Conditions on the Throwing Power of Cadmium Plating Solutions." His results indicated that definite savings of cadmium should be obtainable by choosing conditions which led to more uniform distribution of coatings. DR. WERNICK and MR. F. WILLETS described the details of a commercial installation set up for plating cast iron machine parts which had to be plated with coatings of nickel which could be machined to close dimensional tolerances at a minimum of cost.

PROF. R. PIONTELLI and SIGNOR L. CANONICA of Italy described very satisfactory results which they had obtained in the laboratory

from sulphamate solutions for plating of nickel-cobalt alloys and also described results of work on similar solutions for plating tin-lead and cadmium-zinc alloys.

The final technical session at which MR. N. A. TOPE (chairman of the E.T.S. Midlands Centre) took the chair, was devoted to papers on the structure of electrodeposits.

At the dinner and dance some 220 persons were present. A toast to the "Electro-depositors' Technical Society" was proposed by Sir Ernest Fisk, M.I.E.E., chairman of Electric & Musical Industries, Ltd., to which Dr. Wernick replied. A toast to the "Guests and Kindred Societies" was proposed by Major L. H. Peter of the Westinghouse Brake & Signal Co., Mr. W. B. Phillips, president of the American Chamber of Commerce in London, responding. Among other guests at the dinner were Mr. V. Z. de Ferranti, M.C., president of the Institution of Electrical Engineers, Sir Robert Pickard, Mr. W. L. Pinner, past-president of the American Electroplaters' Society, and Dr. W. E. Garner, C.B.E., F.R.S., president of the Faraday Society.

House-Heating Experiments

Efficient Use of Fuel

A TWOFOLD investigation to determine the smallest consumption of fuel required for adequately warming houses is being carried out at Abbots Langley, Herts, near the Building Research Station of the Department of Scientific and Industrial Research. For the first part of the experiment, eight houses have been built to ascertain the amount of heat conserved through employing different degrees of thermal insulation. These houses are now occupied. The second part covers the provision of twenty houses with identical thermal insulation but with different heating systems (employing 92 appliances) with the object of ascertaining which are most economical. The arrangements are said to represent the experiment of its size and type in the world.

Each room is being fitted with instruments, including thermometers both of the ordinary type and also devised to give at a central control room a continuous record over the 24 hours. In the initial stages ventilation and the opening of doors and windows will be controlled to secure comparable circumstances in each house, and eupatheostats will be installed to show comfort conditions. Two meteorological stations will give particulars of the weather on the site. The houses will be empty at first so as to facilitate the obtaining of data by the thirty investigators free from variations due to differing habits of residents. They will be assumed to be occupied by standard families each consisting of a father (not home to lunch), a mother (at home), and two schoolchildren. Having obtained figures for these, the investigators can make allowances for size of family, hours of work and other individual departures from the norm when the actual tenants move in. Some of the results are expected to be available next spring.

In presenting particulars of the above development, Dr. F. M. Lea (Director of Building Research) stated that the heating of houses took more coal (in one form or another) than any other single purpose. This amounted in 1938 to 60 million tons or one-third of all coal consumed in this country, which works out at 1,500 heat units per dwelling for inadequate warming of small parts of each. In the United States the figure was 1,700 for heating the whole house at relatively high temperatures, and in Germany 880 for warmth equal to that in British homes. The present experiments would indicate performance of improved devices and methods under practical conditions.

Power Engineers' Conditions

Holiday Arrangements

THE National Joint Board for the Electricity Supply Industry has reached an agreement upon the hours to be worked by the technical staffs of electricity supply undertakings. Shift employees' hours are to average not more than forty-four a week over a six-month period. Time off equivalent to excess hours worked is provided for and arrangements are made for the methods of operating shifts. Day employees' hours are to be the same as the undertaking's recognized office hours with equivalent time off for overtime—except in emergency conditions. Provision is also made for special overtime allowances in certain cases and for allowances in respect of stand-by duty outside normal working hours.

An employee with six months' continuous service in the electricity supply industry on May 1st in any year is to be entitled to two weeks' holiday. Employees with longer service are to be given the annual holiday customarily granted by the undertaking but not less than fourteen days with an additional day for each year of service over twelve months up to a maximum of twenty-one days in all.

For the purpose of classification of the salaries of inside staff the kW capacity of a station not receiving a supply from an outside source is to be the m.c.r. of the generators in kW.

Where in such stations rotary convertors or rectifiers are installed for purposes of external distribution 33⅓ per cent of their kW capacity is to be added to the station capacity. If the convertor plant is partly used for station purposes the proportion so used is not taken into account. For stations receiving a supplementary supply from outside the station capacity is to be augmented by 33⅓ per cent of the rating of convertor or rectifier plant or 12½ per cent of transformer plant used. These provisions will apply only to staff concerned with the operation of this plant.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IN this issue the British Electricity Authority is advertising for a chief engineer at a salary of £4,750 per annum and deputy chief engineers at £3,000 rising by annual increments of £100 to £3,500. Applications have to be sent in before October 7th.

Dr. H. G. Taylor, D.Sc.(Eng.), D.I.C., M.I.E.E., F.Inst.P., has been appointed director of the British Welding Research Association in place of Mr. A. Ramsay Moon. Dr. Taylor was born in Somerset and educated at the Plymouth and Devonport Technical College, the Barrow-in-Furness Technical School, Battersea Polytechnic and the City and Guilds (Engineering) College. In 1921, he joined Vickers, Ltd., of Barrow-in-Furness, as an apprentice electrician and obtained the firm's scholarship taking him to the University of London where he graduated with first class honours in electrical engineering. Subsequently he was awarded the M.Sc.(Eng.) degree for a thesis on the collection of current from commutators and slip-rings.

Dr. H. G. Taylor

Dr. Taylor then joined the Metropolitan-Vickers Electrical Co., Ltd., as a college apprentice, and was later posted to the Research Department. In 1929, he joined the staff of the Electrical Research Association to commence investigations on the subject of earthing. The E.R.A. has since published many reports on earthing with which Dr. Taylor has been associated and for which work he was awarded the degree of Doctor of Science in Engineering by London University. In 1937 Dr. Taylor was appointed electrical engineer to the Copper Development Association, and it was here that he commenced his connection with the welding industry which continued with the Philips concern. Dr. Taylor hopes to take up his new appointment by the beginning of November.

Miss J. U. Spellman has been appointed librarian to the Copper Development Association, Kendals Hall, Radlett, Herts. Miss Spellman was formerly in charge of the research department library of Electrical & Musical Industries, Ltd.

Mr. T. Handley, director of the recently-formed Thos. Handley & Co., Ltd., was for many years branch manager of Ensign Lamps, Ltd.

Mr. E. A. Fowler, M.I.E.E., is the chairman of the Installations Group of the North Midland Centre of the Institution of Electrical Engineers for the 1947-48 Session.

Mr. G. C. Sutherland, A.M.I.E.E., who is at present with the British Engine Boiler & Electrical Insurance Co., has been appointed representative for Scotland by the Electric Construction Co., Ltd., as from October 1st. His address will be 170, Hope Street, Glasgow (telephone: Glasgow—Douglas 1704).

Mr. R. W. Towers has been appointed a director of the Rheostatic Co., Ltd.

Mr. P. M. Maxwell, electrical engineer to Batley Corporation since 1931, is to retire at the end of the year. He has been with the Corporation for forty years.

Mr. J. E. M. Johns and **Mr. D. F. Harrison** have been appointed joint general managers of the valve department of the Mullard Wireless Service Co., Ltd. **Mr. L. A. Sawtell** has been appointed commercial manager and will be responsible for distribution in the entertainments field. These appointments date from June 1st.

Sir Ernest Fisk, governing director of the E.M.I. group, has been admitted to the freedom and livery of the Worshipful Company of Glaziers.

At the third Inter-Company Olympic of the County of London Electric Supply Co., Ltd., and associated companies, the chairman of the company, **Sir Robert Renwick,** was presented with a silver Queen Anne tankard by the employees of the Group. The tankard was presented by Mr. Young of the Bournemouth Company, who is the oldest employee, having completed fifty years' service. Mr. Young in turn received from Sir Robert a set of bowls, also from members of C.L.E.S.C.O. Lady Renwick presented the prizes at the sports, at which there was an attendance of some 7,000 employees.

Wills.—Mr. R. W. Biles, of Foye House, Leigh Woods, Bristol, a past chairman of the Western Centre of the Institution of Electrical Engineers, who died on March 30th last, left £4,698 gross, with net personalty £4,501.

Mr. T. A. G. Margary, late borough electrical engineer of Wolverhampton, who died on June 24th last, left £3,931 gross, with net personalty £3,893.

Mr. T. F. Mackay, electrical engineer, left £3,483 (net personalty £3,427).

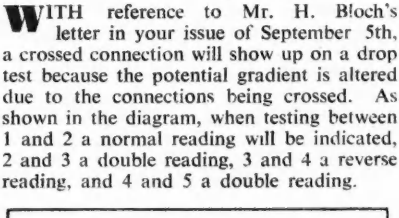
Mr. T. D. Trees, of the Electrical Engineering Department, Admiralty, left £3,359 (net personalty £3,208).

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Armature Drop Testing

WITH reference to Mr. H. Bloch's letter in your issue of September 5th, a crossed connection will show up on a drop test because the potential gradient is altered due to the connections being crossed. As shown in the diagram, when testing between 1 and 2 a normal reading will be indicated, 2 and 3 a double reading, 3 and 4 a reverse reading, and 4 and 5 a double reading.



A crossed connection will not show up on a "growler" since the principle of the "growler" is that when a short occurs the induced voltage causes a current to flow, thus making the thin steel strip vibrate over the slot in which the faulty coil lies. I consider the drop method the most satisfactory method of testing an armature, as by this means any fault is shown quite definitely.

*London, S.W.*9. F. L. THOMERSON.

Potential Death Traps

AS one engaged in the design of domestic electrical appliances I am increasingly concerned at the growing disregard on the part of certain cheap-jack manufacturers of the provision of adequate protection to the user.

Only this week I was attracted by a window display advertising a range of gifts that were offered in exchange for a given number of purchase coupons. One of these gifts, labelled "Boiling Ring," comprised an inverted sheet-metal tray mounted on four legs, a hole being pierced in the top to accept the porcelain element refractory; the supply was by two single leads of obviously poor quality flex entering the tray through a ragged hole devoid of any form of insulation. Because of the close proximity of the element to this flex entry it was very apparent that the rubber covering on the flex would soon burn and disappear, with the resultant shorting of the wire on to the sheet-metal tray. Lack of provision for earthing constituted a further danger, rendering the user liable to severe shock, or worse, upon handling.

From inquiries made to the local electricity department and police it would appear that under existing conditions an appliance cannot be condemned until the inquest has taken place. Cannot something be done to ensure that all makers of electrical goods shall adhere to a standard safety specification, thereby protecting the general public?

Birmingham. G. E. NICHOLLS.

E.P.E.A. Visit

THE Northern Division, Meter and Instruments (Technical) Group, of the Electrical Power Engineers' Association made the first meeting of the 1947-48 session a visit to the transmitter of the B.B.C. at Moorside Edge, Huddersfield. After lunch the party, numbering about fifty, went by bus over the moors to the transmitting station.

Returning to the Plough Hotel, Huddersfield, the formal meeting was held, and in the absence of Mr. F. Seddon, the chair was taken by Mr. A. E. Prophet. The success of the "Gadgets' Day" was the reason given by Mr. Rodaway for suggesting that the opportunity should be given to other meter engineers to show their worth, and this was approved. The next meeting of the Group will be held at the Engineers' Club, Manchester, on October 4th, when Mr. J. E. Dyson will open a discussion on stabilizers.

Sussex Industries Exhibition

THE second Sussex Industries Exhibition, organized by the Sussex Engineers and Manufacturers' Association, was opened at the Dome and Corn Exchange, Brighton, on September 17th and closes to-morrow (Saturday). Amongst electrical exhibitors are W. Aird & Co. (electric drills, polishing machines, compressors, soldering irons, etc.), Short Wave (Great Britain), Ltd., and Brighton Tele-Radio Services, Ltd. (television aerials, "Eddystone" components, "Avo" test instruments, etc.), Automatic Telephone & Electric Co., Ltd. (intercommunication equipment), Hoover, Ltd. (vacuum cleaners), and Page & Miles, Ltd. (refrigeration equipment, domestic appliances, lighting fittings, etc.).

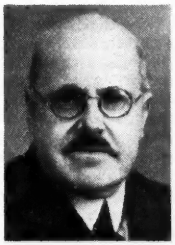
I.E.E. Centre Chairmen—I

Brief Biographies of New Officers

THE new chairman of the North Western Centre of the Institution of Electrical Engineers is **Mr. R. A. S. Thwaites,** B.Sc. (Eng.), chief engineer and manager of the Manchester Corporation Electricity Department. Mr. Thwaites was educated at Dulwich College and Central Technical College, South Kensington, and served his apprenticeship with W. H. Allen Sons & Co., Ltd., Bedford, with whom he was engaged from 1911 to 1922 on the design, manufacture, testing and erection of machinery for power stations. In 1922 he joined the Yorkshire Electric Power Co., and during the next thirteen years served the company in various capacities. He left Yorkshire to join the North Wales Power Co., of which he became chief engineer and manager in 1939, a position he held until 1941 when he went to Manchester as deputy chief engineer with the Electricity Department. He was appointed "chief" in 1944. Mr. Thwaites is a member of the National Consultative Committee of the C.E.B., of the I.M.E.A. Council and the E.D.A. Council, and is spokesman of the N.W. District Coal (Electricity) Advisory Committee. He is a member of the Institutions of Civil and Mechanical Engineers.

Mr. R. A. S. Thwaites

Mr. E. S. Ritter, chairman of the North Midland Centre, was educated at Limavady, Co. Londonderry, Cheltenham College, and Faraday House, and his training included a works course with Willans & Robinson, Ltd., Rugby, and Bruce Peebles & Co., Ltd., Edinburgh. He also attended classes at Heriot Watt College and Edinburgh University. After a short period with the Limavady Electric Supply as engineer in charge, he joined the National Telephone Co., Ltd., with whom he carried out inventory work. His association with the G.P.O. commenced in 1912, when he was "lent" by the National Telephone Co. as inventory and junior engineer. In the following year he was appointed assistant engineer in the Engineer-in-Chief's Research Section, and his work included testing and loading trunk telephone cables, including submarine, and also telegraph transmission studies. He was appointed executive engineer, Telegraph Section and Research Section, in 1930 and was engaged on picture transmission, teleprinters and voice-frequency circuits. In 1933 he was appointed to his present position of assistant staff engineer, Designs Section, now Subscribers' Apparatus Branch, where he is in charge of design and development of telephone apparatus installed on subscribers' premises.



Mr. E. S. Ritter

Mr. P. C. Barnes, M.A., chairman of the Mersey and North Wales Centre, was born at Frome, Somerset, and educated at Rossall School and Downing College, Cambridge.

Mr. P. C. Barnes

Mr. Barnes subsequently served a college apprenticeship with the Metropolitan-Vickers Co., and in 1927 became technical assistant with Bolckow, Vaughan & Co., Ltd. Two years later he took up his present position as resident electrical engineer with Pilkington Bros., Ltd., glass makers, St. Helens, Lancs.

The chairman of the Western Centre is **Mr. J. B. Gwynne Lewis,** district manager of the South Wales and West of England area of George Ellison, Ltd. Mr. Lewis was educated at the Bristol Grammar School and at Skinners School, Tunbridge Wells. He became a pupil to Sir Horace Boot, then chief electrical engineer to the Tunbridge Wells Corporation. His technical education was received at the Swansea Technical College and in 1902 he entered the college apprentice course of the British Westinghouse Co., Ltd., Trafford Park. After completing his training he was transferred to the Sheffield office staff of the company as sales engineer and in 1910 joined the Cardiff office staff of the old British Westinghouse Co. He took up his present position with George Ellison, Ltd., in 1918. Mr. Lewis is a member of the South Wales Institute of Engineers and of the Association of Mining Electrical and Mechanical Engineers.

Mr. J. B. G. Lewis

Public Lighting

Discussions at the A.P.L.E. Southport Conference

THE conference of the Association of Public Lighting Engineers which concluded at Southport last Friday will be remembered as much for the enthusiastic participation of the thousand delegates in these discouraging times as for the constructive nature of the discussions on the various papers. Despite the scant prospect of the early extension of public lighting beyond the present 50 per cent of pre-war fuel consumption, every session was packed and speakers had useful contributions for solving problems both of the immediate future and of the time when the much-desired improvement in the illumination of our streets again becomes permissible.

Before the conference proper was opened a meeting was held for the first time of the associate members of the Association and there was a discussion as to the most appropriate time for holding future meetings. At the opening of the annual meeting which followed the retiring president, Mr. W. N. C. Clinch, presided. It was announced that Mr. Thomas Wilkie (Leicester) had been elected president and Mr. N. Boydell (Eastbourne) vice-president, with Mr. L. A. Doxey (Leeds), Mr. J. H. Morrison (Bolton) and Mr. P. Richbell (Croydon) filling vacancies on the Council. Mr. P. Crawford Sugg and Mr. E. Stroud were re-elected associates' representatives. Mr. C. I. Winstone (Gas Light & Coke Co.) and Mr. E. J. Stewart (Glasgow) have both expressed a desire to retire from the Council. The former was elected an honorary member, while Mr. Stewart has consented to continue as honorary editor of the *Transactions*.

Induction of President

The MAYOR OF SOUTHPORT (Councillor James Peet, J.P.) then officially opened the conference and the President, thanking him for his welcome, said that it was difficult in present circumstances to do all that was desired in public lighting but every effort should be made to pave the way for the future. Inducting the new president, MR. CLINCH recalling that Mr. Thomas Wilkie had been president in 1930, said that during the past year the Council had made every effort to ensure that the Association was not "in cold storage." There had been a deputation to the Ministry of Transport and a report which had been prepared had been published in the Association's *Journal*. Moreover, the officers of the Ministry of Transport consulted the Council on matters relating to street lighting.

The present curtailment of public lighting was, in some respects, necessary and there was also the psychological aspect because of the coal shortage. If street lighting was on the scale which public lighting engineers would desire, there were at once complaints that coal was being wasted.

MR. WILKIE, taking the chair, proposed a vote of thanks to Mr. Clinch for the manner in which he had carried out his duties and presented him with the past-president's badge and certificate. MR. N. BOYDELL, the newly-elected vice-president, then expressed his appreciation of the honour done him, and his chairman, COUNCILLOR MARSHALL, extended an invitation to the Association to hold its next conference in Eastbourne.

Mr. Wilkie's Address

Heavy rain greeted the delegates when they assembled to hear MR. THOMAS WILKIE deliver his presidential address, which together with the paper on "Street Lighting in Relation to Road Safety, Traffic Problems and Crime Prevention" by MESSRS. A. E. MARCHANT (Barking) and R. BELL (Erith) was dealt with in our last week's issue. An outstanding feature of the discussion which followed the paper was the support which all the representatives of the police gave to the demand for increased public lighting not only in relation to the present restrictions—which it was implied should be relaxed—but generally. MR. E. C. LENNOX (Nesco) maintained that the claims for reduced lighting in order to conserve coal supplies were offset by the damage to the public morale and the results of accidents.

MR. W. BICKNELL (Siemens) expressed satisfaction that, at the instance of the British Standards Institution, a sub-committee had been set up by the Road Research Board under the chairmanship of Sir Clifford Paterson "to consider the general question of street lighting in relation to road accidents and to make recommendations as to the best method of securing adequate lighting for the needs of vehicular and pedestrian traffic."

Other speakers made it clear that there was an increasing tendency for lighting authorities and the police to co-operate in the endeavour to reduce accidents and prevent crime. Several references were made to the lack of adequate information relating to the causes of street accidents after dark. Mention was also made of the possibility of accidents due to poorly designed street lighting installations and uniformity of lighting in adjacent areas was strongly urged.

In the afternoon, discussing the paper on "Maintenance of Public Street Lighting" by MR. J. WOODHOUSE (Sheffield), MR. A. G. TOOKEY (Bristol) criticized the Sheffield system of maintenance and specially objected to the lamp attendants having to fill in so many forms. This should be done by a supervisor, inspector

or foreman. He asked if the lamp attendants and inspectors in Sheffield were happy under the system.

MR. R. S. BRADLEY (Portsmouth) said that it appeared that gas lighting was more costly to maintain than other forms. MR. R. PARKER (Aberdeen) asked for cost of maintenance of the two piece refractor with sealed-in prisms and also the non-ventilated refractor. THE PRESIDENT said he thought that a fortnight was too long an interval between cleaning lamps and his own practice was to have them cleaned every week.

MR. W. HINE (Y.E.P.) said his problems of maintenance were entirely different from those of the author because he had to deal with a number of lighting authorities throughout an area of some 3,000 sq miles. In many cases it was absolutely impossible to carry out a routine inspection such as that outlined in the paper. MR. L. A. DOXEY (Leeds) said the lamps were cleaned once a week in some parts of his city but in other parts 16 or 17 days was enough. He suggested that before manufacturers put a new fitting on the market they should try to erect, say, thirty with a tower wagon on a very wet day. He also urged manufacturers to produce a dustproof fitting.

MR. C. C. SMITH (Liverpool) said that in Liverpool they had not yet employed refractors and he was not certain they were as efficient as they were made out to be. It seemed to him that too much attention had to be paid to them to get the best results. MR. J. H. MORRISON (Bolton) thought the solution of the refractor problem was to bring them in for cleaning and forget all about them. There was a flat type of reflector available which was covered with a thin sheet of glass which in turn was covered with celluloid to keep out the dirt.

Light Measurement

On Wednesday morning in the discussion of the paper "Street Lighting Photometry" by DR. S. ENGLISH, DR. N. A. HALBERTSMA (Holland) said he did not agree with the idea of trying to measure candle power in certain directions in the street because it was very difficult to prevent light from other sources affecting the measurement. He understood that the proposal to measure in this way was made because of objections to measuring candle power in the laboratory but in his view there were sources of error on the road far worse than any encountered in the laboratory. A great deal of work had yet to be done in connection with the measurement of brightness as distinct from illumination.

MR. E. STROUD thought Dr. English's suggestions made the draft specification more complicated and difficult to operate. The measurements proposed ignored the horizontal width of the beam and also the distribution closer to the lantern and, in his view, would be subject to the same criticism as the "test point" values of the original B.S.S. 307. Surely such measurements would be accurately determined in the laboratory. It would be better if measurements were taken, say, two feet into the carriageway and not on the kerb.

The brightness with a given installation depended on the road surface, which itself varied with time and repairs, and also with atmospheric considerations. So long as there was sufficient light and the object was in contrast with the background, it was not of great importance that the background was of a definite high brightness. A great deal depended on the type of light source and the design of fitting which should have a large reflective surface and give a wide distribution.

MR. P. HARTILL suggested that in any future specification or Code of Practice, it would be desirable to include some limitation of lantern brightness in certain directions. If this was not practicable, there should be some recognition of the merits of sources of low brightness.

MR. H. S. ALLPRESS (Simplex) agreed with Dr. English that the question of surface brightness, *per se*, had a very dangerous aspect. There was a good deal to be said for photometry as a means of ensuring that the installation was working with reasonable accuracy but the checking of the actual performance was far better left to the laboratory.

MR. L. T. MINCHIN felt there was a real need for the man on the job to be able to see whether he had been given what he expected. The specification stipulated so many lumens per 100 ft of road, no matter where they went, and while the author had said that it bore no relation whatever to visibility it did give some indication of the illumination on the footways and the brightness on the footways.

MR. W. H. BURMAN (North Middlesex Gas Co.) said that one aspect of photometry lost sight of was the effect of a gradient on the illumination on the road.

DR. ENGLISH, replying, agreed with Dr. Halbertsma as to the necessity for excluding extraneous light, but he emphasized that it was not possible to get the installation in the laboratory to measure its performance as a whole. In reply to Mr. Stroud, he said it was always easy to get round a single point measurement but not so easy to get round three. The only way of ensuring that all the lamps were performing properly was to test individually, although it would take longer.

Annual Luncheon

DR. N. A. HALBERTSMA, Adviser to the Dutch Ministry of Works on matters relating to public lighting, proposed the toast of the Association at the annual luncheon held on the Wednesday. He emphasized that public lighting was not just a branch of illuminating engineering but a separate profession in itself. The public lighting engineer had not only to deal with technical problems but human problems not only in regard to the public but also in regard to the large staffs that were necessary for the

supervision and maintenance of street lighting installations.

THE PRESIDENT, responding, said that the present restriction on public lighting was greatly hampering social life and social intercourse and therefore was bound to have a bad result in the long run. Public lighting authorities were restricted to 50 per cent of their pre-war lighting. That represented about 500,000 tons of coal a year—about the amount that had been lost during the recent Grimethorpe strike, or about two weeks' output of outcrop coal. Whilst the amount of coal saved by the restriction on public lighting was relatively small, there were other factors brought in by this restriction which affected our lives very seriously, road accidents and crime, for example. Too much stress was often laid on the cost of street lighting, which was actually relatively little when other savings involved were taken into account.

MR. A. E. N. TAYLOR (Ministry of Transport) responding to the toast of the guests said that the decision to cut street lighting by 50 per cent was not taken by the Ministry but at the " highest possible Government level."

Side-Street Lighting

A large number of speakers took part in the discussion of the paper on " Side Street Lighting " by MR. R. W. STEEL (Cheltenham). MR. E. C. LENNOX (Newcastle-on-Tyne) thought the A and B class roads recommended in the Ministry of Transport Report sufficiently covered all needs. There was plenty of room for sub-groups within these two classes. There was no reason why non-traffic routes could not be well lighted with 120-ft spacing, or perhaps less in the wider roads, with 150-W lamps.

MR. C. C. SMITH (Liverpool) spoke in favour of cut-off or partially cut-off fittings and said that every effort should be made to use brackets fixed to the houses. Too often the siting of lamps at important points had been influenced by cost but he thought the lighting engineer should get a free supply for such lamps. MR. H. ALLPRESS (Simplex) did not believe it was absolutely necessary to provide even road surface brightness. The question of the colour of the road surface, the trees, and the number of pedestrians using the road must be taken into account. On the question of tree-lined roads MR. R. PARKER (Aberdeen) urged consultation between those responsible for laying out new estates and the lighting authorities. Where possible, trees should be planted at the back of the footpaths.

MR. J. C. CHRISTOPHER (G.E.C.) thought that the trouble with side-street lighting was that it was planned largely on the pattern of trunk road lighting, whereas it was primarily for the pedestrian and for police purposes. If this were accepted, then there did not seem to be much future for cut-off lighting for side streets. He wondered whether there might not be a type of side-street lighting which would make no effort to produce uniform road brightness but would concentrate on lighting from the point of view of the pedestrian. MR. L. T. MINCHIN expressed the view that cut-off lighting for side streets could be very good provided it was properly applied.

MR. J. A. PROWSE said that a sodium lantern rated at 3,000 lumens in a dusk-to-dawn season used 548 kWh, consuming one-third of a ton of coal. A comparative gas lantern consumed 250 therms per annum or 3½ tons of coal. COUNCILLOR E. ROSCOE (Worsley) spoke in favour of reducing street lighting rather than reducing the supplies of coal to industry. MR. H. T. DUKE (Grimsby) suggested that side-street lighting should be planned with an eye to the possibility of particular streets becoming main traffic routes.

MR. STEEL, replying, emphasized that he asked for a 20-ft mounting height but not that the illumination or the effect of the illumination should be reduced. There should, however, be an illuminated background in these cases. An important consideration in laying out any installation was not so much the capital cost as the subsequent maintenance cost.

On Thursday afternoon, MR. A. B. KNAPP-FISHER, F.R.I.B.A. (secretary of the Royal Fine Art Commission) addressed the conference on " The Royal Fine Art Commission and Lamp Columns." He pointed out that the Commission had neither the powers nor the inclination to force its ideas or ideals upon street lighting authorities but it tried to ensure that its recommendations were not only practical but realistic. Co-operation between the Commission and the electricity supply industry had brought about a much better design of power stations. Lamp standards presented an opportunity for good streamline designs with no knobs or ornamentation. Complete standardization should be avoided and there should be closer co-operation between manufacturers and lighting authorities. Slides of various designs of lamp standards were then shown both by Mr. Knapp-Fisher and by M. BAART DE LA FAILLE (Amsterdam) who indicated practices in his city.

Ministry and Manufacturers

MR. A. E. N. TAYLOR (Ministry of Transport) spoke of collaboration between the Ministry and manufacturers with the object of improving the design of lamp standards. It was hoped that it would not be long before there would be available to lighting engineers, and their authorities, lamp column designs recognized by the best authorities in the country as good.

After the president had been thanked for the manner in which he had presided at the conference there was an "open forum" at which any matter could be raised. One suggestion was that efforts should be made to ensure that there should be separate lighting committees. Another was that the basis of the Association should be broadened and that there should be decentralization and local sections.

COMMERCE and INDUSTRY

School Lighting Experiment. Fulham Branch Offices.

AN experiment in school lighting by fluorescent lamps, taking into account the surrounding colour scheme, was demonstrated to members of the electrical industry and directors of education from many parts of Yorkshire at the Sandford Secondary Modern School, Leeds, on September 19th. The tests were carried out under the supervision of Mr. J. W. Howell, area engineer of the Leeds Lighting Service Bureau of E.L.M.A. with the co-operation of the Leeds Education Authority and the City Architect's Department. A luncheon was held at the Queen's Hotel, Leeds, at which Mr. A. J. Johnson, of Leeds, chairman of the Mid-East England Area Lighting Service Bureau Committee, presided, spoke of the effect of bad lighting on the eyes of children and said that greater attention would have to be paid in future to the correct installation of modern equipment; it was evident that heavier capital charges must be faced to reach modern standards. The experiments had been conducted in an attempt to find a lighting and colour system which would impose the least strain on the eyes. Mr. Howell described the tests in the four classrooms.

Coal Statistics

During the week ended September 13th, the total output of saleable coal was 3,581,300 tons (226,800 tons open-cast), as compared with 3,784,800 tons (162,200 tons open-cast) for the week ended September 7th, 1946. Tonnage lost for various reasons (mainly through disputes) was 338,500. Consumption by electricity undertakings fell from 462,000 tons in the week ended September 7th, 1946, to 454,000 tons in the week ended September 13th, 1947. In the same period the consumption of coal by gasworks declined from 386,000 tons to 382,000 tons. Stocks at electricity undertakings at September 13th were 3,907,800 tons and those at gasworks 2,398,900 tons.

Council of Industrial Design

The second annual report of the Council of Industrial Design contains particulars of its activities during the past year. The most important of these was, of course, the organization of the "Britain Can Make It" Exhibition. This exhibition interrupted the normal activity of the Council, but towards the end of the year discussions with industry were resumed on the setting up of Design Centres. These included discussions with the Electrical Appliances Development Committee of B.E.A.M.A. and a number of leading manufacturers of electrical domestic appliances. Following discussion with the Policy Committee of the British Engineers' Association, that body and B.E.A.M.A. decided upon the formation of a Design Committee representing those two organizations and the Council for Industrial Design, to study the question of the design of engineering and machine tools. A conference on industrial design, sponsored jointly by the F.B.I. and the Council, was held in London in September, 1946, and the proceedings are being published by the Council.

Holiday Camp Lighting

An interesting example of the trend of modern lighting is to be seen at the recently opened Middleton Tower Holiday Camp, near Morecambe. The camp dining hall, a converted aircraft hangar, has a service capacity for 2,500 guests at one sitting. The hall measures 175 ft long by 78 ft wide. The size of the building and the absence of roof lights makes artificial lighting necessary when meals are being served. The design of illumination was entrusted to Miller-Hepworth, Ltd., and it was decided to use the company's standard fluorescent fitting type 33, twin tube, direct lighting model as the unit of illumination. This fitting embodies two 80-W fluorescent tubes mounted in a moulded opal "Perspex" reflector with end-mouldings of pressed aluminium, spray-finished in blue enamel. The cowlings house all the electrical control gear and have quick-release cover plates.

Each half of the dining hall was allotted two rows of sixteen fittings, spaced at 10 ft 6 in.

Fluorescent lighting in the dining hall of Middleton Tower Holiday Camp

centres on axes of 17 ft centre to centre. The complete installation consists, therefore, of a total of sixty-four fittings which are suspended by chromium-plated tubes 3 ft below the ceiling. All the fittings are equipped with the company's new "Perspex" diffusing grille. The suppliers for the installation were Electrical Accessories (Lancaster), Ltd.

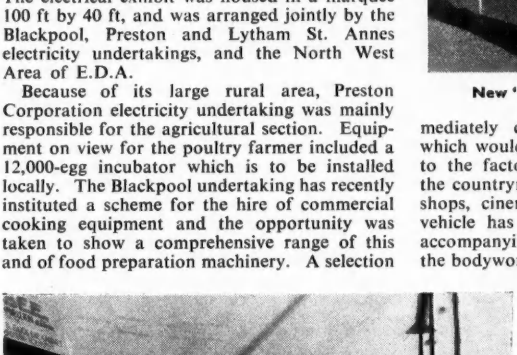
Contract Price Adjustment Formulæ

The latest figures for use in connection with the B.E.A.M.A. contract price adjustment formulæ are as follows:—Rate of pay for adult male labour at September 13th: 110s. (unchanged); Board of Trade index figure for intermediate products, September 13th: 226·9, the figure for August (against 222·5 for July).

"Country Comes to Town" Exhibition

An exhibition was staged in Stanley Park, Blackpool, from August 20th to September 6th under the auspices of the National Farmers' Union and was visited by about 110,000 people. The electrical exhibit was housed in a marquee 100 ft by 40 ft, and was arranged jointly by the Blackpool, Preston and Lytham St. Annes electricity undertakings, and the North West Area of E.D.A.

Because of its large rural area, Preston Corporation electricity undertaking was mainly responsible for the agricultural section. Equipment on view for the poultry farmer included a 12,000-egg incubator which is to be installed locally. The Blackpool undertaking has recently instituted a scheme for the hire of commercial cooking equipment and the opportunity was taken to show a comprehensive range of this and of food preparation machinery. A selection



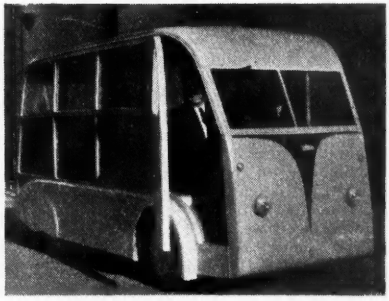
Agricultural section at the recent Blackpool Exhibition

of domestic apparatus was provided by the Lytham St. Annes undertaking.

Electricity was well to the fore in the many demonstrations on the showground and one item of interest is that a finished loaf was produced 40 minutes and 5 seconds after the wheat had been cut at a local farm, a world record. The wheat was cut at 2.35 p.m., rushed to the Park by car, and before a big crowd was threshed in 3½ minutes, milled in 5½ minutes and then baked by students of the Food Technology Department of Blackpool Technical College in an electric bread oven.

Battery Electric Car

When the Government announced the proposal to abolish the basic petrol ration, Brush Coachwork, Ltd., of Loughborough, immediately devised a battery electric vehicle which would be suitable for taking workpeople to the factory, country children to school or the countryman and his family and staff to the shops, cinemas, golf and so on. A prototype vehicle has already been built and from the accompanying illustration it will be seen that the bodywork follows the lines of the "shooting brake" or estate van which has lately become so popular. On the larger chassis, 25/30 cwt, the vehicle has bucket seats, upholstered in brown leatherette, for eleven adults apart from the driver, and ample room at the rear for luggage. For use as a school bus it can be adapted to carry about twenty small children. Its range is forty miles a day on one charge at a running cost of 1s. 10d. calculated at ½d. per kWh. Smaller models are being built on 10/14 cwt and 18/22 cwt chassis.



New "Brush-Bred" electric estate car

Fluorescent Street Lighting

The British Thomson-Houston Co., Ltd., has issued a Lighting Bulletin (No. 10) entitled "The Application of Fluorescent Lamps to Street Lighting," by L. J. Davies and W. D. Sinclair of the company's Research Laboratory. This Bulletin is based on a paper read by the authors before the Association of Public Lighting Engineers' Conference in September

1946, and it is of considerable historic importance as it describes the first two fluorescent street lighting installations, in High Street, Rugby, and Bond Street, London.

Radio Industries Ball

Prizes valued at £400, consisting of radio sets and a radiogramophone, have been given for presentation at the Radio Industries Ball, to be held at the Royal Albert Hall, on October 3rd. Proceeds from the sale of programmes will go to the Electrical Industries Benevolent Association. Companies which have given prizes are: British Insulated Callender's Cables, Ltd.; Bush Radio, Ltd.; E. K. Cole, Ltd.; A. C. Cossor, Ltd.; Decca Record Co.; E.M.I. Sales & Service, Ltd.; Ferranti, Ltd.; General Electric Co., Ltd.; McMichael Radio, Ltd.; Murphy Radio, Ltd.; Philco Radio and Television Corporation of Great Britain, Ltd.; Pye, Ltd.; and Ultra Electric, Ltd. Tickets for the ball (£2 2s. each) can be obtained from Mr. W. G. J. Nixon, Radio Industries Club, Magnet House, Kingsway, W.C.2.

European Plan

The plan for the restoration of European economy drawn up by sixteen nations in response to the request of Mr. Marshall, the American Secretary of State, was published this week. It sets out the goals which it is hoped to reach, with American aid, by 1951. Coal output is to be increased by a third of this year's figure, to 584 million tons of which 250 million tons would be provided by Great Britain. The production of steel is put at 80 per cent more than this year's output, Great Britain's share rising from 12·7 to 15 million tons. Electricity output is to be raised by 40 per cent above this year's level, i.e., by about 70,000 million kWh above the 1947 output. Plant capacity is to be raised by 25 million kW; the 1951 capacity in Great Britain is expected to be just over 13 million kW, against the present figure of about 9 million kW. It is proposed that oil-refining capacity should be raised to 2½ times the pre-war level.

Fulham Material Supplies

A proposal to set up branch offices of the Fulham Electricity Department in Manchester, Birmingham and Glasgow has been recommended for approval by the Electricity and Lighting Committee. The scheme was suggested by the borough electrical engineer (Mr. W. C. Parker) in view of the ever-deteriorating position with regard to the supply of materials. A report on the subject states that in spite of every possible care in planning ahead, even to the extent in some instances of carrying stocks up to two years' requirements, there is a very serious threat to the electricity supply owing to failure to obtain components for repairs and maintenance. The proposed branch offices would be staffed by members of the Department who would give their whole time to the progressing of outstanding orders. Certain firms in the three cities have offered office facilities for a nominal figure. In order that the Council's representative in Glasgow may spend a reasonable amount of time at home during week-ends it is proposed that he should make the journeys by air. With regard to the London area, it is recommended that two members of the staff shall be employed on progress work within a radius of 40-50 miles and that for this purpose two small cars of the shooting brake type shall be purchased.

Ekco-Ensign Lamp Publicity

The wide range of "Ekco" lamp sales aids has been extended by the introduction this autumn of new cut-outs, posters and window streamers, and includes a large window centre-piece and smaller cut-outs. Among the new items are a bright and attractive double-crown poster featuring a child's head, a novelty cut-out for either hanging or standing, showing a hand holding a lamp, a counter or window cut-out with stand-up lamp and lettering, and a window

New "Ensign" lamp window streamer

streamer of particularly strong design. So far as "Ensign" lamps are concerned, many of the sales aids produced earlier are maintained in the 1947/48 range. New items have, however, been added, which include a crown poster with a nautical theme and a bold streamer (40 in. long) for use as a pelmet or window bill carrying the slogan "Ensign Lamps — the Reliable Lamps for Brighter Homes." The company is re-introducing its window dressing service this season.

A.E.M.T. Dinner-Dance

If the Ministry of Food regulations permit the Association of Electrical Machinery Traders intends to hold its second annual dinner and dance on December 5th, at the May Fair Hotel, London, W.1.

Britain and Atomic Energy

Sir Robert Renwick, Bt., chairman of the County of London Electric Supply Co., Ltd., was the speaker at a luncheon of the Society of Individualists at the Connaught Rooms, London, W.C.2, on September 18th, at which the president, Sir Ernest Benn, Bt., presided. Sir Robert Renwick severely criticized the Government for its handling of national and international affairs and particularly for the way in which it had approached the matter of atomic energy development. He claimed that Great Britain was in a position to attain the lead in this direction, but the Government had

allowed the United States to acquire the knowledge possessed by our experts and cause us to lag seriously behind. He thought that a scheme should be prepared for the most intense industrial reconstruction in Britain based on the large-scale use of atomic power against the time when "sane Government, science and industry renewed their wartime comradeship."

Reinstatement Order

Complaint was made to a Reinstatement of Employment Committee sitting at Redruth recently by Cecil Edward James that whereas at the time he joined the R.A.F. nearly five years ago he was classified as a junior assistant with the St. Austell & District Electric Light & Power Co., Ltd., he was now only designated as a learner-linesman and paid the recognized labourer's rate of 1s. 11½d. an hour. The chairman, Engineer Rear-Admiral J. H. Hawken, observed that applicant had failed to make application under the interrupted apprenticeship scheme which was devised to help such cases as his. The St. Austell Company was ordered to classify James as a junior assistant and to continue to employ him on not less favourable terms than those which would have been applicable to him had he not been a person to whom the Act applied.

S.E. London Technical Institute

The South East London Technical Institute has issued its prospectus of day and evening courses for 1947-48. In addition to classes relating to electrical and allied subjects, courses of lectures have been arranged covering electrical engineering economics, high voltage engineering, communication networks, and communication engineering economics.

Business Efficiency Exhibition

The Business Efficiency Exhibition will be held in the Empire Hall, Olympia, from October 1st to 11th. Exhibitors will occupy considerably more than 38,000 sq ft and the exhibits will include silent typewriters, automatic bookkeeping machines, adding machines, duplicating machines, dictating machines, and much other business equipment.

British Institute of Management

The British Institute of Management was registered on September 10th as a company limited by guarantee, without share capital. The number of members is unlimited. Each member is liable for £1 in the event of winding up. The word "Limited" is omitted from the title by licence of the Board of Trade. The objects of the Institute are to raise and maintain standards of management in Great Britain, to help to create a continuous supply of good management, to encourage education, training and research in relation to management, to establish a central institution and study centres, etc. The term "Management" covers industrial, commercial, national and local government, public enterprise, agricultural, institutional and general management. The council is to consist of not less than ten or more than thirty-five members, and the first members include Mr. C. G. Renold, chairman of Renold & Coventry Chain Co., Ltd.; Mr. G. Chelioti, director, General Electric Co., Ltd.; Mr. A. McKinstry, deputy chairman, Babcock & Wilcox, Ltd.; and Mr. J. E. Myers, principal of the College of Technology, Manchester.

The Bolton Vacancy

Bolton Electricity Committee is to advertise the position of electrical engineer and manager at a commencing salary of £1,944 a year in accordance with the agreement made by the National Joint Committee of Local Authorities and Chief Electrical Engineers. In September last year the Committee decided to advertise for a successor to Mr. H. E. Annett at a salary of £1,600. An advertisement was issued by the Associated Municipal Electrical Engineers and the Electrical Power Engineers' Association asking engineers not to apply for the post as the salary was not in accordance with the agreement. Bolton said they were not a party to this agreement. Later the Electricity Committee circularized local authorities throughout the country seeking their support and asked the Minister of Fuel and Power to intervene, but Mr. Shinwell declined. Mr. H. E. Annett, who should have retired on January 28th this year was re-engaged for a further period of twelve months, Bolton agreeing to pay him £1,900 a year, plus bonus, in addition to superannuation allowance. Mr. Annett's period of re-engagement terminates on January 27th.

British Plant for Canada

An order has been placed with C. A. Parsons & Co., Ltd., by the Regina, Saskatchewan, municipality for a 20,000-kW steam turbo-generator. It is expected to be installed in time for the winter load of 1950-51.

Purchase Tax Decision

The Eralite Manufacturing Co., Ltd., has received a ruling from the Customs and Excise Department that its "Chaudelaine" towel rail is subject to purchase tax at the rate of 66⅔ per cent of the wholesale price.

J. H. Tucker's New Offices

On November 22nd, the seventh anniversary of the destruction of their Tyseley works by enemy action, J. H. Tucker & Co., Ltd., will formally open the newly reconstructed office block at King's Road, Tyseley, Birmingham, and are holding a reunion party.

Change of Address

The Electricity Department of Spalding Urban District Council is now at the Flaxmill, Pinchbeck, Spalding, Lincs.

Overseas Electrical Trade

Exports Still Exceed 1946 Figures

THE holiday period during August almost invariably results in a fall in overseas trade as compared with July and last month was no exception. Exports of electrical apparatus and machinery fell by no less than £1,134,495 from July's record figure of £7,333,719, while imports at £332,082 were some good exceptions. In particular increased shipments of all types of electric motors are recorded, and there were substantial advances in purchases of submarine cables, accumulators, house service meters, converting machinery, switchgear and switchboards. It might seem that at last the

Table I.—Electrical Exports and Imports

Class	Exports			Imports		
	Aug., 1947	Aug., 1946	Monthly Av., 1938	Aug., 1947	Aug., 1946	Monthly Av., 1938
	£	£	£	£	£	£
Telegraph and telephone wires and cables, submarine	34,149	20,867	17,289			
Ditto, not submarine	313,515	280,446	71,803	6,559	1,808	31,246
Wires and cables, other than telephone and telegraph, rubber insulated	480,212	236,737	117,533			
Ditto, insulation other than rubber	480,316	343,308	153,256			
Commercial radio apparatus	104,535	53,031	28,296	*	*	*
Domestic radio receivers	380,015	325,123	36,755	282	10,609	10,148
Telegraph,telephone and signalling apparatus	†510,327	536,934	242,716	8,708	2,750	9,243
Other radio, etc., apparatus	183,327	132,231	57,848	17,987	669,903	47,870
Valves	102,486	146,902	41,272	56,127	7,235	10,893
Electric carbons, furnace	*	*	*	7,897	2,238	4,054
Other electric carbons	*	*	*	4,146	3,401	2,301
Electric lamps	105,983	92,088	49,440	2,351	1,518	10,265
Other lighting apparatus	270,891	186,684	48,565	24,702	1,347	38,662
Primary batteries	36,166	49,916	13,572	146	423	3,549
Accumulators, portable	218,088	152,155	28,874	*	*	*
Ditto, stationary	26,325	27,785	19,773	*	*	*
Ditto, parts and accessories	32,780	32,338	—	*	*	*
Electric cooking and heating apparatus	211,597	120,528	30,664	*	*	*
Commercial electrical instruments, including ammeters, voltmeters, etc., and parts	83,575	43,543	15,878	12,647	6,348	32,057
House service meters	108,936	34,219	15,791			
Other electrical instruments	65,950	42,123	9,612			
Electro-medical apparatus other than X-ray	20,433	19,099	3,038	*	*	*
X-ray apparatus, vacuum tubes and parts	38,892	18,181	4,881	46,654	4,238	9,734
Insulating materials, not elsewhere specified	101,749	106,243	19,343	*	*	*
Unclassified electrical goods and apparatus	326,184	317,839	108,083	30,929	14,917	52,980
Generators, complete, up to 200 kW	118,523	52,629	38,071	*	*	*
Ditto, over 200 kW	137,958	73,090	119,079	*	*	*
Ditto, parts	107,248	22,582	—	*	*	*
Railway and tramway motors	58,282	20,895	15,977			
Other motors up to ¼ h.p.	38,959	19,867	9,001			
Ditto, over ¼ h.p., but under 1 h.p.	33,551	12,526	2,470	15,818	7,167	26,033
Ditto, 1-250 h.p.	248,934	143,580	96,637			
Ditto, over 250 h.p.	16,177	23,572	20,960			
Converting machinery	31,778	9,386	101,304	*	*	*
Transformers including coils	315,915	165,354				
Rectifiers for power house use	16,027	3,647	3,463	*	*	*
Motor starting and controlling gear	116,658	79,507	50,866	*	*	*
Switchgear and switchboards, other than telegraph or telephone	465,846	168,465	184,533	*	*	*
Other electrical machinery	20,845	12,702	15,497	83,301	11,467	14,455
Electric vacuum cleaners and parts	198,931	98,721	26,662	*	*	*
Other electrically-operated portable appliances	37,161	47,820	10,394	13,828	2,482	24,627
Total	6,199,224	4,273,663	1,829,198	332,082	747,851	328,117

* Not classified separately. † The figures for 1947 are not strictly comparable with those for previous years.

£223,597 lower. Even so exports were nearly half as much again as the August, 1946, figure and nearly three-and-a-half times the monthly average for 1938.

The decrease in exports was fairly general under all classifications, though there were increasing allocation of generating plant to the home market was beginning to have a noticeable effect on exports; the August figure of £363,729 for generators and parts was £272,372 less than that for July but actually in August last year the value was

only £149,301. Vacuum cleaners had a bad month with only £198,931 worth sent abroad compared with £368,903.

South Africa (£609,119) was the largest purchaser of electrical goods and apparatus, with India (£569,208) a good second. New Zealand (£277,984) and Australia (£230,526) maintained their demands at around the previous month's figures and Burma (£171,283)

Table II.—Distribution of Exports of Electrical Goods and Apparatns

Destination	August, 1947	August, 1946	Monthly Av., 1938
	£	£	£
Eire	153,068	92,928	37,726
Channel Islands ..	39,212	34,839	12,177
Palestine	69,732	45,365	8,426
British West Africa ..	42,252	37,461	12,889
Union of South Africa	609,119	555,964	162,584
Southern Rhodesia ..	57,373	37,593	9,632
British East Africa ..	54,119	57,177	7,893
British India ..	569,208	434,463	123,789
Burma	52,113	16,684	5,337
British Malaya ..	171,283	63,126	32,792
Ceylon	47,418	28,914	15,048
Hong Kong	49,896	45,624	12,939
Australia	230,526	227,635	197,366
New Zealand ..	277,984	134,019	96,225
Canada	29,112	16,305	12,547
British West Indies ..	38,051	24,261	12,954
Other British Countries	104,097	58,531	21,265
Soviet Union ..	2,739	—	36,781
Finland	27,125	20,439	5,969
Sweden	113,175	58,366	14,948
Norway	131,464	66,935	12,881
Iceland	8,430	36,918	2,796
Denmark	41,189	83,769	18,907
Poland	15,021	12,559	9,702
Netherlands	80,757	77,986	22,010
Belgium	101,176	145,711	11,208
France	55,496	164,124	16,082
Switzerland	26,374	20,297	3,768
Portugal	77,370	72,070	6,512
Spain	16,909	82,742	3,813
Czechoslovakia ..	20,898	19,051	7,256
Yugoslavia	22,428	44,120	1,475
Greece	17,546	14,339	4,926
Turkey	10,370	38,367	7,684
Portuguese East Africa	14,136	5,570	6,942
Egypt	122,561	48,478	13,176
Iraq	110,404	1,063	5,530
Iran	96,255	6,230	16,345
China	66,818	44,590	4,119
United States of America	15,982	14,602	5,839
Mexico	11,780	47,633	1,466
Venezuela	40,690	36,212	2,936
Chile	12,912	9,996	6,635
Brazil	60,219	34,997	11,164
Argentine Republic ..	176,601	79,792	45,452
Other Foreign Countries	145,043	120,475	46,371
Total	4,236,431	3,318,320	1,134,284

bought heavily last month. Although not maintaining the exceptionally high figure for July (£259,122) Sweden took £131,175, only slightly less than its neighbour, Norway (£131,464), a fairly consistently good customer. France (£55,496) more than doubled her purchases.

South Africa took almost one-third of the submarine cable exports, while India had about one-quarter of the rubber-insulated cable. Between them these two countries also accounted for about one-quarter of the other types of insulated cables. Once again India headed the list of buyers of domestic radio apparatus, taking £107,089 worth out of the total of £380,015. Of the £510,327 worth of telegraph, telephone and signalling apparatus sold South Africa bought £109,944. About one-third of all the generating plant sold went to India (£112,135), which was also the largest purchaser of electric motors (£76,296) taking slightly more than South Africa (£71,080). Russia was second in the list of customers for "other electrical machinery," accounting for £113,659 worth, compared with India's £226,024, out of a total of £967,069.

The heavy decline in imports compared with the previous month is attributable almost entirely to reduced purchases of furnace electric carbons (£7,897, as against £110,545) and "other electrical machinery" (£83,301, as against £252,394). Actually in nine out of the sixteen classes shown slight increases were recorded. The total figure for imports in August was very nearly down to the level of the monthly average for 1938.

Next Week's Events

Monday, September 29th

BIRMINGHAM.—Grand Hotel, 7 p.m. Electrical Power Engineers' Association (Midland Technical Group). "Gas Turbines," by R. G. Voysey.

Tuesday, September 30th

LEICESTER.—Electricity Offices, Charles Street, 6.45 p.m. Leicester Electrical Society. "The Reconstruction of Freeman's Meadow Generating Station," by D. H. Parry.

Wednesday, October 1st

LONDON. — Olympia. Radio Exhibition. (October 1st to 11th).

MIDDLESBROUGH.—Cleveland Technical Institute, 6.30 p.m. I.E.E. Tees-Side Sub-Centre. Chairman's address by E. H. Jordan.

SOUTHSEA.—Council Chambers, 6.30 p.m. I.E.E. Southern Centre. Chairman's address by D. D. Rayner.

RUGBY.—Corporation Electricity Showrooms, 6.45 p.m. I.E.E. Rugby Sub-Centre. Chairman's address by H. G. Middleton.

Friday, October 3rd

BIRMINGHAM.—Crown and Cushion Hotel, Perry Barr. Illuminating Engineering Society (Birmingham Centre). Ladies' night. Buffet dance.

EDINBURGH.—Royal British Hotel, 7.30 p.m. Scottish Engineering Students' Association. Address by V. P. Mackay.

ELECTRICITY SUPPLY

New Bedford Station. Drastic Restrictions in France.

Bedford.—NEW GENERATING STATION.—A site at Goldington has been chosen for the erection of a new generating station the estimated cost of which, when completed, is £4,934,500 (equal to £41 12s. per kW installed). A report submitted by the chief engineer and general manager of the Electricity Department (Mr. P. G. Campling) explains that the site selected is that recommended by Merz & McLellan in 1943, when no objection was raised from a town planning point of view, but it is now necessary to consult the North Bedfordshire Joint Planning Committee. The site is within the borough and covers approximately 130 acres, being bounded on the east by the River Ouse and on the south by the New Cut. The route of the C.E.B's 132-kV overhead lines passes within half a mile of the site. The station will ultimately contain four 30,000-kW turbo-alternators generating at 11 kV, with five 300,000 lb per hr pulverized-fuel-fired boilers equipped with electrostatic dust precipitators. Flue gases will be discharged through two 300-ft chimneys. Initially, two sets and three boilers will be installed and the River Ouse will be used for the circulating water system, but for the second stage one cooling tower will be needed for use when the flow of water is insufficient. The main items of plant have been allocated between the following manufacturers :— Turbo-alternators, G.E.C. (Fraser & Chalmers turbines); condensers and feed-heating plant, Mirrlees, Watson Co.; boilers, Clarke, Chapman & Co.; and pipework, Stewarts & Lloyds. The Prebend Street station will, it is anticipated, eventually become redundant, but it is likely to continue in operation for some years at its present or reduced capacity.

Bolton.—POWER STATION EXTENSION.—The Central Electricity Board has directed the Corporation to extend its Back-o'-th'-Bank generating station by the installation, ready for commercial operation in July, 1951, of a 30,000-kW turbo-alternator, an auxiliary 1,250-kW alternator, and two boiler units each of 180,000 lb per hr.

Burton-on-Trent.—SUPPLY TO HOUSES.—At the request of the Repton R.D.C. the Corporation is to carry out a scheme for the provision of electricity to the second section (consisting of 146 houses) of the Woodville housing estate. The estimated cost of laying the necessary underground cable is £6,880 and of the services £1,550. A supply is also to be provided to the George Street area at Church Gresley for houses owned by the Swadlincote U.D.C., the cost being estimated at £3,580 for cable extension and £900 for services.

HIGH-VOLTAGE LINE.—The Electricity Department is to reconstruct the Lullington high-voltage overhead line at an estimated cost of £1,815.

Edinburgh.—PROGRESS AT PORTOBELLO.—Work is progressing satisfactorily on the first 60,000-kW cross compound turbo-alternator and single 540,000 lb per hr pulverized fuel boiler for Portobello power station and it is hoped that the plant will be in operation by September, 1949. The Corporation has recently received a further direction to install a duplicate set for commercial operation not later than July, 1952. It is proposed that ultimately the existing site will house six sets; the later sets may be larger.

Kingston-upon-Thames.—LOAD SHEDDING.—A pamphlet prepared by the borough electrical engineer (Mr. E. J. Jarvis) explains the group rota scheme which is to be put into operation in the undertaking's area this winter. The area has been divided into a number of small groups each identified alphabetically and latters appear on a chart which indicates the possible interruptions of supply. Each day is divided into three periods of four hours, an arrangement which has been adopted because one peak demand occurs in each. These periods are divided into columns numbered 1 to 4 and premises whose group letter appears under these may have their electricity supply interrupted in that order.

Lossiemouth.—CHARGES TO BE RAISED.—Additional revenue of about £2,000 per annum will be obtained as a result of proposed increases in charges, which Provost A. Maclean told the Town Council were the first in twenty years. The "unit" charge under two-part tariffs is being raised from ¾d. to 1d. and the cooking flat rate will be subject to a similar increase.

Perthshire.—PITLOCHRY DAM BURSTS.—The River Tummel, swollen by recent heavy rain, broke through the foundations of the Pitlochry dam on Tuesday last week. A 7-ton derrick with a 120-ft jib collapsed and brought down with it another crane weighing 5 tons. A footbridge erected for workmen was swept away and some equipment was lost. An engineer on the site stated that the damage was not serious and would probably be repaired within two or three weeks.

Stockton-on-Tees.—HIRE PURCHASE.—At last week's meeting of the Lighting and Power Committee the general manager (Mr. N. Hunter) reported on the advisability of re-introducing the hire purchase scheme (a limited scheme applying to tenants of new houses is already in existence) and recommended that the scheme generally should be re-introduced on the following terms:—A deposit of 25 per cent of the cash price, the balance to be spread over twelve equal monthly payments, and 10 per cent being added to cover interest, etc., the scheme to apply to appliances with a cash

price of £5 or over. It was decided to defer the proposal for a month to give the Gas Department an opportunity to consider it so far as that Department was concerned.

Sutton Coldfield.—DEARER ELECTRICITY.—An increase of 25 per cent in charges is recommended by the Electricity Committee, the new rates to come into force after the next meter readings.

Thanet.—PRE-WAR TARIFF RESTORED.—The Margate, Broadstairs and District Electricity Board announces a further reduction in charges which will make the tariff the same as before the war. On April 1st of this year the 33⅓ emergency wartime increase was lowered to 15 per cent, and from October 1st this will be abolished altogether.

Yorkshire.—STAGGERED HOURS IN INDUSTRY.—Some 8,000 industrial power users will be affected by the Yorkshire Electrical Power Co.'s staggered hours scheme which comes into operation on October 6th. The scheme involves two-cycle and three-cycle rotas and for this purpose the area of the company and its associate companies has been divided into six districts. In the two-cycle rota work will start at 7 a.m. and finish at 4 p.m. with three hours on Saturday morning; for the late period, work will be from 11 a.m. to 9.20 p.m. In the three-cycle scheme the early period will start at 7 a.m. and continue until 4 p.m., the middle period from 7 a.m. to 5.30 p.m. and the late period from 11 a.m. to 8.30 p.m.

Overseas

France.—WINTER PROSPECTS.—In spite of an appreciable increase in power production since the end of the war electricity restrictions are again having to be introduced in France. This is partly due to the dry weather and also to growing consumption and the inability to obtain sufficient coal for thermal plants. The Electricité de France has asked for a general switch over to night work where possible and a reduction in consumption of 20 per cent after October 1st. Thermal power available increased from 2,200,000 kW in January, 1946, to 2,500,000 kW this year and is expected to reach 2,650,000 kW next January. Hydraulic power should amount to 3,830,000 kW next January.

From October 1st electricity supplies to industry will be cut off on three days a week, it is announced. In the case of domestic users, the supply will be withdrawn on two days each week except that, as far as possible, electricity will be made available at midday and dusk for the preparation of meals.

New Zealand.—MEETING THE POWER SHORTAGE.—According to the National Bank of Australasia, although the immediate winter emergency has been overcome, the gravity of the long-term problem of New Zealand's deficiency in electric-generating capacity continues to occupy the attention of the authorities. The Government has announced that it is sending its chief electrical engineer abroad at once in a search for suitable diesel or steam-driven plant as an auxiliary to the hydro-electric stations which are the main source of supply. In the meantime it is giving thought to the question of what long-range restrictions will have to be applied until the supply is adequate to meet all demands for power. One method under consideration—and this has the full backing of the supply authorities' engineers—is the drastic one of declining permits for the establishment of any new industries, and/or urging existing industries to install their own generating plants.

Control of Engagement

LAST week the Ministry of Labour issued the Control of Engagement Order, 1947 which is designed to divert men and women from non-essential occupations to industries engaged in production for export.

The Order applies (with certain exceptions) to men between the ages of 18 and 50 and women of from 18 to 40. Its effect is that any persons of these ages seeking employment must do so through a local office of the Ministry or an approved employment agency. They will then be offered a choice of positions one of which they must accept or be "directed" to suitable work. Failure to comply with a direction (which will remain in force for six months) will be punishable by fine or imprisonment, or both. Equally, employers seeking labour must do so through the same channels. The Order is to take effect from October 6th and as at present drawn will expire at the end of next year.

Part-time employment of not more than thirty hours a week and employment in a managerial, professional, administrative or executive capacity do not fall within the scope of the Order. It is provided that women under twenty and men with family responsibilities shall not be directed away from their home districts. Appeals against direction may be made to national service officers and from their decisions to local appeal boards.

The interests of directed persons will continue to be safeguarded by the existing Control of Employment (Directed Persons) Order, 1943, and Defence Regulation 58A ensures that wages and conditions shall not be inferior to those prevailing in the industries to which they are directed.

I.M.E.A. at Liverpool

REPRESENTATIVES of 43 electricity undertakings visited Liverpool for the meeting of the Council of the Incorporated Municipal Electrical Association, of which Mr. J. Eccles, the city electrical engineer, is president. The Corporation provided a civic welcome and entertained the members of the Council to luncheon and to dinner. They were also taken on a sea trip to North Wales and visited a penicillin factory.

E.D.A. Conference

Papers Read at Scarborough

FLUORESCENT lighting, space heating and farm electrification were among the subjects discussed at a conference held on Wednesday and Thursday this week at Scarborough by the British Electrical Development Association, Mid-East England Area. The relation of fluorescent lighting to free economy was stressed particularly by MR. W. J. JONES, director of the Electric Lamp Manufacturers' Association, who pointed out that fluorescent lamps had a luminous efficiency of approximately three times that of filament lamps and their substitution for filament lamps would reduce the electrical load by two-thirds.

Every 80-W fluorescent lamp at present installed therefore saved the country 1½ cwt of coal per 1,000 hours of lighting and released over 100 W of generating capacity for other productive purposes. If the commercial and industrial lighting load were converted to fluorescent the saving in coal would be about one million tons a year. Furthermore about 300,000 kW of plant would become available during national peak periods and the saving in kWh would amount to the total output of three stations the size of Battersea, and part of the cost of the distribution network would be saved.

Space Heating Load

In a paper on "Space Heating by Electricity —Economics and Policy," MR. G. F. MOORE, borough electrical engineer and general manager, Keighley, said that there was a shortage of 2,000 MW of generating plant to meet the peak load and since the end of the war the home market had been flooded with two million kW of electric radiators and other space-heating appliances. Domestic electricity sales had increased between 1939 and 1946 by about 50 per cent and it was unlikely that any significant portion of the increase was due to anything but space heating.

The rise in public demand for electricity for space heating was due to shortage of coal, the demand for better heating made possible by the increased purchasing power of the consumer, and the inability of householders to obtain domestic labour and the consequent greater use of labour-saving appliances. These causes were likely to continue. By far the bulk of the present space-heating load was due to "topping-up" or "cold snap" demands. Were the peaks so produced preferable to those resulting from both background and topping-up heating and which was likely to produce the better annual load factor?

In the cold snap last February there was a demand of 900 MW attributable to the prevention of freezing, etc. Though this was 10 per cent of the present available generating capacity it would be a very much smaller proportion of the extended capacity which would be necessary to meet the background heating load and its overall effect would be diminished accordingly.

The continuance of the burning of solid fuel would cost £45 million per annum in atmospheric pollution. With advance in mechanization of mines there would be an increasing quantity of low-grade coal which only power stations could absorb.

Farm Supply Costs

Speaking on "Full Farm Electrification," MR. C. A. CAMERON BROWN (Edmundsons) emphasized the economic aspect of the problem. Farmers, he said, had on the whole been paying too little for the service given to them. An average for the country of about £20 per farm was absurd. The reason was partly too little electrification and partly that tariffs were too low. He saw no economic need for the general running charge on the farm to be less than 1d. per kWh with some reduction, say ¾d., for special off-peak loads. Nor need the fixed charge be too low.

The majority of British farms could be afforded every convenience of electrical operation with a maximum demand of 5 kVA and with a substantial part of the consumption of electricity during the night hours. Steam raising (3 kW), water heating (1½ kW) and water pumping (½ kW) could all be done at night, the day load comprising lighting, milking machinery, refrigerator, cooler, hoist, grain grinding mill, mixer, cake breaker and small workshop tools. A 3-h.p. pneumatic blower or hammer mill could be on a change-over switch with the 3- or 5-h.p. mixer motor which would be run once or twice a week, while similarly a change-over switch could control the use of the water heater and milking machine. Assuming for labour reasons full use on only five days, the total annual consumption would be over 16,000 kWh (excluding Saturdays and Sundays) giving at 1d. per kWh a revenue of £67 which could hardly be called a poor return for the m.d. involved.

Training Chemists

From the British Association of Chemists, 175, Piccadilly, London, W.1, we have received a copy of a report by its Education Committee upon "Education in Chemistry" (price 2s.). This makes proposals with regard to the initial training in schools and the form of education at technical colleges and universities. It deals also with the place and standing of chemists and chemical technicians in industry and with the recruitment and training of teachers of chemistry.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Berry's Electric, Ltd., reports a profit for the year ended March 31st of £88,082, as compared with £75,277 for the preceding year, to which is added interest on investments, profit on sales of leasehold property and a balance of £8,599 brought in, making £100,076. After providing for depreciation, etc., there is a balance of £84,963. General reserve receives £22,500, reserve for income tax £31,409, reserve for N.D.C. and profits tax £4,136, and reserve for repairs to premises £7,500. The ordinary dividend for the year is maintained at 12½ per cent, less tax, and £9,724 is carried forward.

The British Aluminium Co., Ltd., has declared an interim ordinary dividend of 4 per cent (against 2 per cent), less tax. It is stated that the reversion to an increased interim dividend should not be taken as an indication that the dividend for the year will be increased. The total payment for 1946 was 10 per cent.

Aerialite, Ltd., reports a profit for the year ended June 1st of £124,319 of which taxation absorbs £78,625. This compares with a net profit for the previous year of £14,950. It is proposed to pay a final dividend of 100 per cent, making a total of 150 per cent for the year (against 55 per cent).

The Nigerian Electricity Supply Corporation, Ltd., is paying a final dividend of 5 per cent and a bonus of 2 per cent, making 10 per cent for the year. The total distribution for the previous year was 12½ per cent which included a bonus of 2½ per cent.

Solus Teoranta (electric lamp manufacturers, Eire) report a profit for the year to June 30th last of £14,418 (against £13,729 for 1945-46). Depreciation absorbs £5,049 (£6,144) and taxation £4,300 (£4,400). The final dividend of 2½ per cent again makes 7½ per cent for the year, and £1,438 (£1,431) is carried forward.

The Yorktown (Camberley) & District Gas & Electricity Co. is holding an extraordinary general meeting on October 10th at Reigate to determine whether the members wish the electricity undertaking only, or both the gas and electricity undertakings, to be transferred to the British Electricity Authority on the vesting date under the Electricity Act, 1947.

Waite & Son, Ltd., report a profit for the year ended March 31st last of £14,386, as compared with £13,964 for 1945-46. Taxation requires £7,048 and £5,015 is placed to reserve. The dividend is maintained at 5 per cent.

The Scottish Power Co., Ltd., is repeating its interim dividend at 3 per cent.

The Electric Supply Corporation, Ltd., is again paying an interim dividend of 3½ per cent.

W. T. Henley's Telegraph Works Co., Ltd., has declared the usual interim ordinary dividend of 5 per cent.

Murex, Ltd., is paying a final dividend of 10 per cent and a bonus of 2½ per cent, making a total of 20 per cent for the year (same).

New Companies

Dudley Electrode Co., Ltd.—Registered September 15th. Capital, £50,000. To acquire the sole manufacturing and selling rights in Great Britain and certain other territories for electric arc welding under the patent rights owned by Societe Anonyme pour l'Industrie de l'Aluminium Cluppis/Lausanne (Switzerland) and Werkzeugmaschinenfabrik Oerlikon Buehrle & Co. Abt. Elektrodenfabrik, Zürich-Oerlikon, and sometimes known as the Oerlikon-Intercito Process. Subscribers: O. J. W. Dryburgh and D. Drummond. Solicitors: Taylor & Humbert, W.C.1.

Merlin Mouldings, Ltd.—Registered September 9th. Capital, £2,000. Manufacturers, wholesalers and repairers of, and dealers in, dynamos, motors, armature and electrical plant, etc. M. A. Polchar is the first director. Regd. office: 12, Catford Broadway, S.E.6.

Increases of Capital

A. Reyrolle & Co., Ltd.—Capital increased by £750,000, in £1 unclassified shares, beyond the registered capital of £1,250,000.

Rothermel Corporation, Ltd. — Capital increased by £125,000 beyond registered capital of £140,000.

Bankruptcies

L. G. Hosier, Watling Street, Radlett, Herts., electrical engineer.—Last day for receiving proofs for dividend September 30th. Trustee, Mr. J. M. Clarke, 20, Eaton Place, London, S.W.1.

O. P. Lowther, St. Gilda's, Brookway, Friars Cliff, near Christchurch, Hants, electrical engineer.—Composition dividend of 10s. in the £, payable September 30th at the offices of Mr. T. J. M. Macleod, 4, Bucklersbury, London, E.C.4.

W. T. Spencer, 376, Oldham Road, Newton Heath, Manchester, electrician.—Application for discharge to be heard on October 13th at the Court House, Quay Street, Manchester.

Liquidations

Middleton Electric Co., Ltd., electrical contractors, Middleton-on-Sea.—At the statutory meeting of the creditors a resolution was passed confirming the voluntary liquidation of the company and Mr. A. E. Orbell, 6 & 7, Old Steine, Brighton, was appointed liquidator.

STOCKS AND SHARES

STOCK Exchange markets are pursuing a series of switchback courses that surprise members of the House as much as they confuse and perplex the public. British Government stocks rise and fall in a manner more appropriate to mining shares than to sedate gilt-edged securities. The possibility of an autumn Budget is debated with conflicting arguments How the Government's plans for industry will work out, affords matter for everybody's speculation. Stock Exchange prices, after being very flat, took on an appearance of strength for which there seemed no tangible cause. Falls predominate in our price-lists compared with those of a month ago, when none of the sections escaped the effects of widespread depreciation. This time, there are some bright spots: a study of the tables will help to suggest the channels into which capital is being directed.

Investment has received useful guidance in the shape of Sir Stafford Cripps' comprehensive list of export targets. However sceptical the investor may be about their attainment, they give at least a practical indication of the extent to which the principal industries will be encouraged to expand their exports. With exports now taking precedence over the home market so far as production is concerned, a corresponding priority for supplies and materials to the most favoured industries is implied.

Heavy Machinery

The Government's plan for the expansion of the export trade gives a high place to a number of specialized industries, in which machinery and manufactured goods are included. Among these, there figure, of course, in the mind of the investor the companies which are concerned mainly with heavy machinery, generating plant, etc. About half a dozen well-known companies are engaged in the business and the shares of most of them come into what the Stock Exchange calls the "blue chip" class: that is to say, the shares are considered sound investments, and the companies are regarded with respect on account of past history, present performance and their balance sheets. Amongst the companies are the General Electric, English Electric, Crompton Parkinson, and Associated Electrical Industries. There are various others, but these may be considered typical of the class of company occupied in the manufacture of heavy machinery.

Month's Changes

Prices of home electricity supply shares show virtually no change over the past month. C.E.B. stocks have been similarly maintained, but railway stocks have generally been marked down one or two points. Electrical equipment shares show improvement in a few instances, but, as the accompanying lists show, losses on the month are in the majority. G.E.C., Crompton Parkinsons and A.E.I. recovered well, but against these there are further losses in Arons, Electric Constructions, Walsall Conduits, Ever Ready and Lancashire Dynamos. Telephone Manufacturing shares are also easier. Cossors and E.M.I. have revived, but other radio shares weakened. In the engineering group, International Combustions, Babcocks, and Mather & Platt are noticeably good. Cable & Wireless ordinary lost ground. Among overseas stocks, Nigerian Electric dropped 7s. 6d. on the reduced dividend.

A.E.I.

Associated Electrical Industries has an issued capital of £8,669,240, of which £6,000,000 is in ordinary shares of £1 each. The dividend for years was a regular 10 per cent raised last year to 15 per cent, of which 2½ per cent was declared as bonus. An interim dividend of 5 per cent in respect of the current twelve months was paid last week. At the present price of 77s. 6d., the yield on the money is a modest £3 17s. 4d., but in view of the business outlook the shares are regarded as a promising investment to put away for future reference.

Company Results

Oldham & Son 1s. shares were introduced to the market last March at a price of 11s. 3d. Accounts recently published fulfil the prospectus forecast of a rise in profits for the year ended in May, and the total 60 per cent dividend accords with the distribution which the board had in mind at the time of the issue. The shares stand now at 9s. 3d., having been up to 13s. 6d. at one time, and show a yield of 6½ per cent. In addition to the larger trading profit, earnings were assisted by a reduction of the E.P.T. charge from £100,000 to £40,000. They represent nearly 160 per cent on the issued capital of £100,000; but this is much smaller than the effective capital employed in the business, states the chairman's review accompanying the report.

Aerialite 1s. shares were also introduced about six months ago, at the price of 14s. 3d. Results now published exceed substantially the prospectus estimates. Trading profit, subject to tax, is returned at £124,320, and a final dividend of 100 per cent, making 150 per cent for the year, has been declared on the £24,710 ordinary capital. The distribution compares with the forecast of not less than 100 per cent. and affords a yield of 8 per cent. on the shares at 18s. 9d.

Anglo-Argentine Trams

One of the minor excitements of the moment is a lively speculation in the securities of the Anglo-Argentine Tramways Company. It is rumoured that the Argentine Government has earmarked a specific sum for the purchase of English-owned tramway companies. On the strength of this, the shares and the debenture stocks of the Anglo-Argentine Tramways

(*Continued on page* 491)

ELECTRICAL INVESTMENTS

Past Month's Price Changes

Company	Est. Comp.*	Last Div.	Middle Month's Price Sept. 19	Rise or Fall	Yield p.c.
Home Electricity Ordinary					
Bournemouth and Poole	66/8	12½	61/–	..	£ s. d. 4 2 0
British Power and Light	37/10	8	34/6	..	4 14 2
City of London ..	34/4	7	31/3	..	4 9 7
Clyde Valley ..	46/5	8	42/6	..	3 15 3
County of London	49/5	10	45/–	–6d.	4 9 0
Edmundsons ..	31/6	6	29/–	..	4 2 9
Elec.Dis.Yorkshire	51/–	9	46/6	..	3 17 4
Elec. Fin. and Securities ..	67/–	15	61/–	–1/–	4 18 4
Elec. Supply Corporation ..	50/8	10	46/–	..	4 7 0
Lancs. Light and Power ..	37/7	7½	34/6	..	4 7 0
Llanelly Elec. ..	29/1	6	26/6	..	4 10 7
Lond.Assoc.Electric	29/6	6	27/–	..	4 9 0
London Electric	31/4	6	29/–	..	4 2 9
Metropolitan E.S.	48/–	9	44/–	..	4 1 10
Midland Counties	51/5	8	47/6	+6d.	3 7 6
Mid. Elec. Power	47/–	9	42/6	–6d.	4 5 0
Newcastle Elec..	32/7	7	30/–	..	4 13 4
NorthEasternElec.	36/6	7	33/6	–6d.	4 3 4
Northampton ..	50/11	10	46/6	–6d.	4 6 0
Northmet Power.	48/2	9	43/6	–6d.	4 3 7
Scottish Power ..	46/1	9	42/–	..	4 5 9
Southern Areas ..	24/–	5½	23/–	..	4 15 7
South London ..	33/–	7	30/–	–6d.	4 10 4
Yorkshire Elec..	50/10	9	46/6	..	3 17 4

Company	Dividend Previous	Dividend Last	Middle Month's Price Sept. 19	Rise or Fall	Yield p.c.
Public Boards					
CentralElectricity:					
1963–93 ..	3½	3½	101¼	..	3 9 0
1974–94 ..	3½	3½	100½	..	3 4 6
LondonElec.Trans.	2½	2½	94½	..	2 13 0
Lond.Pass.Trans.Bd.					
A	4½	4½	120½	–2	3 14 8
B	5	5	116⅛	–1	4 5 10
C	3	3	59½	–1	5 0 10
Overseas Electricity Companies					
Atlas Elec. ..	Nil	Nil	11/9	–1/–	—
Calcutta Elec. ..	6†	6†	40/–	–⅛	3 0 0
Cawnpore Elec...	13	13	53/–	–¼	4 5 4
EastAfricanPower	7	7	46/6	..	3 0 4
Jerusalem Elec...	5	6	25/6	..	4 14 0
Madras Elec. ..	6	8	42/6	+6d.	3 15 6
Nigerian Elec. ..	12½	10	40/–	–7/6	5 0 0
PalestineElec."A"	6†	7†	38/–	..	3 13 9
Perak Hydro-elec.	6	7	12/–	–6d.	—
Tokyo Elec. 6% .	—	—	53½	–7	—
VictoriaFallsPower	15	19	5⅞	+⅛	3 4 7
WhitehallInv.Pref.—		6	26/–	..	4 12 3
Equipment and Manufacturing					
Aron Elec. Ord...	10	15	50/–	–¼	6 0 0
Assoc. Brit. Eng.	8	12	42/6	–¼	5 13 0

Company	Dividend Previous	Dividend Last	Middle Month's Price Sept. 19	Rise or Fall	Yield p.c.
Equipment and Manufacturing (*Continued*)					£ s. d.
Assoc. Elec. :					
Ord.	10	15	77/6	+6d.	3 17 4
Pref.	8	8	39/6	+9d.	4 0 10
AutomaticTel.&El.	12½	12½	58/3	+3d.	4 6 2
Babcock & Wilcox	12½	15	69/6	+4/6	4 6 2
Baldwin,H.J.(2/–)	10	20	8/9	–1/3	4 11 9
British Aluminium	8	10	13/9	+1/3	4 11 4
B.I. Callender's..	—	6⅜	38/–	–1/3	3 9 6
British Rola (2/–)	15	15	3/9	–6d.	8 0 0
BritishThermostat (5/–)	18½	23½	23/9	–2/6	4 19 6
BritishVac.Cleaner (5/–)	30	20	15/–	–3/3	6 13 4
Brush Ord.(5/–)..	10	4	6/6	+3d.	3 1 7
Burco (5/–) ..	20	35	23/3	–⅛	7 11 6
ChlorideEl.Storage	20	20	92/6	–5/–	4 6 7
Christy Bros. ..	17½	17½	75/–	..	4 13 4
Cole, E. K. (5/–)	20	20	17/6	..	5 14 3
Cossor, A. C. (5/–)	12½†	25†	22/6	+2	5 11 1
Crabtree (10/–) ..	17½	17½	38/9	–2/9	4 10 2
CromptonParkinson Ord. (5/–) ..	22½	22½	28/6	–2/6	3 9 0
De La Rue (5/–)	45	50	47/6	+½	5 9 3
Decca (1/–) ..	100	112½	35/–	–2/6	3 4 0
E.M.I. (10/–) ..	8	8	21/–	+6d.	3 16 2
Elec. Construction	12½	12½	45/–	–5/–	5 11 0
Enfield Cable Ord.	12½	7½	41/3	+6d.	3 12 10
English Electric .	10	10	55/9	+2/6	3 11 9
Ericsson Tel. (5/–)	20†	20†	38/9	–3/9	2 11 7
Ever Ready (5/–)	40	40	34/6	–3/–	5 16 0
Falk Stadelmann	7½	10	41/3	–2/6	4 17 1
Ferranti Pref. ..	7	7	32/6	–1/3	4 6 2
G.E.C. Pref.	6½	6½	33/9	+6d.	3 17 0
Ord.	17½	17½	86/3	+1/3	4 1 5
GeneralCable(5/–)	15	25	35/–	–7/6	—
Greenwood&Batley	15	15	50/–	..	6 0 0
H.T.A. (10/–) ..	10	10	16/6	–1/–	6 1 3
Heatrae (2/–) ..	12½	12½	6/3	..	4 0 0
Henley's (5/–) ..	20	20	22/6	–1/–	4 9 1
4½% Pref. ..	4½	4½	24/–	–6d.	3 15 0
Hopkinsons ..	20	22½	4½	–5/–	4 17 0
Intl. Combustion (5/–)	32½	37½	52/6	+8/9	3 11 8
Johnson & Phillips	15	15	66/3	–⅛	4 11 0
LancashireDynamo	22½	22½	47½	–¼	4 12 3
Laurence,Scott(5/–)	12½	12½	10/–	–1/–	6 5 0
London Elec.Wire	7½	10	42/6	–2/6	4 14 1
Mather & Platt ..	10	11	51/3	+3/3	4 5 8
Metal Industries(B)	9	10	46/3	+⅛	4 6 7
Mid. Elec. Mfg. ..	30	35	8½	–⅜	4 2 4
Murex	20	20	80/–	–½	5 0 0
Newman Ind.(2/–)	22½	22½	6/6	–6d.	6 18 7
Plessey (5/–) ..	20	30	22/–	–3/–	—
Parsons C. A. ..	—	12½	70/–	–6/–	3 11 5
Pye Deferred (5/–)	25	25	22/6	–5/–	5 11 0
Radio & Tel. (2/–)	25	40	5/6	..	—
Revo (10/–) ..	20	27½	50/–	..	5 10 0
Reyrolle ..	12½	12½	67/6	–2/6	3 14 0
Scophony (5/–) ..	—	—	6/3	+⅛	—

(*Continued on page* 491)

* Proposed amount of British Electricity Stock to be allotted.
† Dividends are paid free of Income Tax.

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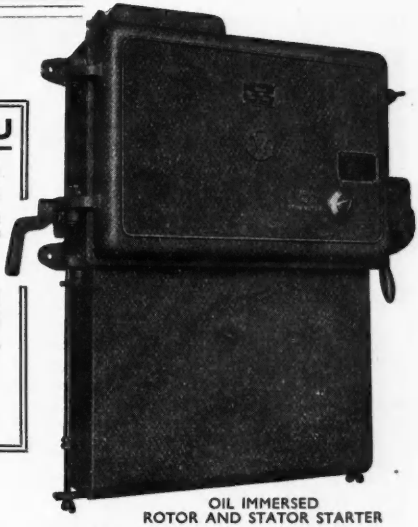

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ELECTRICAL ACCESSORIES

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Company	Dividend Previous	Dividend Last	Middle Price Sept. 19	Month's Rise or Fall	Yield £ s. d.
Equipment and Manufacturing (*Continued*)					
Siemens Ord. ..	7½	7½	31/–	..	4 16 9
Strand Elec. (5/–)	12½	17½	11/3	+1/–	7 15 6
Switchgear&Cowans (5/–) ..	25	10	15/6	–1/3	3 4 6
T.C.C. (10/–) ..	12½	15	30/–	–⅝	5 0 0
T.C. & M. ..	10	10	46/6	+3d.	4 6 0
Telephone Mfg.(5/–)	9	9	9/–	–1/9	5 0 0
Thorn Elec. (5/–)	20	25	21/3	..	5 17 8
Tube Investments	22½	22½	6	–⅝	3 15 0
Vactric (5/–) ..	Nil	Nil	13/9	+2/3	—
Veritys (5/–) ..	7½	2½	5/–	–2/–	2 10 0
WalsallConduits(4/–)	55	70	51/3	–4/6	5 9 4
Ward & Goldstone (5/–)	35	50	66/–	..	—
Watford (2/–) ..	15	15	6/3	..	4 16 0
WestinghouseBrake	14	14	62/6	–3/9	4 9 5
West, Allen (5/–)	7½	10	10/3	+6d.	4 17 7
Traction and Transport					
Brit.Elec.Traction:					
Def. Ord. ..	45	50	1145	..	4 7 5
Pref. Ord. ..	8	8	170	–5	4 14 2
Calcutta Trams..	6½	7½	32/6	–5/–	4 12 4
Cape Elec. Trams	5	6	32/6	..	3 13 10

Company	Dividend Previous	Dividend Last	Middle Price Sept. 19	Month's Rise or Fall	Yield £ s. d.
Traction and Transport (*Continued*)					
Southern Rly.:					
5% Prefd. ..	5	5	69½	–2	7 4 0
5% Pref. ..	5	5	111½	–2	4 9 8
T. Tilling ..	10	10	63/–	+5/6	3 3 6
West Riding ..	10	12	52/6	–1/–	4 11 5
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	121½	–6	4 18 9
Def.	1½	1½	27½	..	5 9 1
Anglo-Portuguese	8	8	29/6	–6d.	5 8 6
Cable & Wireless:					
5½ Pref. ..	5½	5½	114	+½	4 16 6
Ord.	4	4	152½	–3½	2 12 6
CanadianMarconi$1	Nil	4 cts.	11/6	..	—
Globe Tel. & Tel.:					
Ord.	8½†	5†	38/–	–9d.	2 12 8
Pref.	6	6	30/6	..	3 18 7
GreatNorthernTel. (£10)	18	15	30	–1½	5 0 0
Inter. Tel. & Tel.	Nil	Nil	13	–1	—
Marconi-Marine..	7½	7½	28/9	–1/3	5 4 4
Oriental Tel. Ord.	4	4	47/6	..	—
Telephone Props.	6	6	20/6	–1/–	5 17 0
Tele. Rentals (5/–)	10	10	11/6	+1/–	4 7 0

† Dividends are paid free of Income Tax.

Stocks and Shares (*Continued from p.* 489)

suddenly came to life and prices shot up in a remarkable fashion. The gambling stock, that is, the income debenture, removed from our price-lists because the price rarely changed from round about 3 to 5 per cent, rose the other day to 26. The preference shares, which for a similar reason were taken out of our lists, were standing at a shilling or two, and are now 8s. The company has been badly treated in the past by the municipality of Buenos Aires and attention has been drawn here on several occasions to the unfairness of the competition of the municipality's vehicles. Now, however, the proprietors seem to have a prospect of coming into their own again, at all events in some degree, and no little interest is felt in what will turn out to be the ultimate result of the rumours now current.

Market Implications

Manufacturers of generating plant and other heavy electrical equipment are, of course, already known to possess a high priority for supplies by virtue of their fundamental importance to the industrial life of the country. With the industry now cast also for a leading rôle in the development of sales abroad, the case for holding shares in the companies concerned is further fortified. Discrimination was conspicuously absent during the first stages of the market relapse. Support that appeared, however, at the lower levels, showed a much more selective character.

Buyers' attention was largely directed to electrical equipment shares and to those in other industries—such as textiles and vehicles—known to possess official encouragement. In the electrical equipment group, notice is being taken more particularly of the shares in companies engaged in the production of heavy plant. At present prices, the dividends show the buyer a reasonable return on his money, and are supported in most cases by a substantial earnings cover, impressive financial resources, and long records of consistently successful business.

Ventilating Engineers' Jubilee

IN view of present conditions the Council of the Institution of Heating and Ventilating Engineers has decided to cancel the arrangements to hold a jubilee banquet and dance on October 7th. It has been agreed to confine the celebrations to technical meetings, and the final arrangements are as follows:—

October 7th.—Special jubilee meeting in the lecture theatre, Institution of Civil Engineers, Great George Street, S.W.1, when Mr. C. G. Carrothers, B.Eng., M.I.E.E. will read a paper on "Practical relations between Heat and Electric Forms of Energy with special reference to District Heating" (5.30 for 6 p.m.).

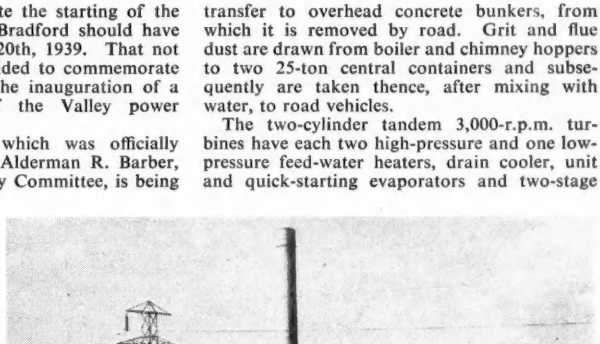
October 8th.—Autumn Council meeting (10 a.m.). Autumn special meeting in the lecture theatre, Institution of Mechanical Engineers, Storey's Gate, S.W.1, when Mr. C. G. Vokes, M.I.Mech.E., A.F.R.Ae.S., M.S.A.E. will read his paper "Air Filtration in War as Applied to Peace Conditions." (5.30 for 6 p.m.)

Extensions at Bradford

Inauguration of New Plant

THE jubilee to celebrate the starting of the electricity supply in Bradford should have been held on September 20th, 1939. That not being feasible, it was decided to commemorate the date this year with the inauguration of a 45,000-kW extension of the Valley power station.

The present scheme, which was officially opened last Saturday by Alderman R. Barber, chairman of the Electricity Committee, is being carried out in two sections. The first, forming part of the 1946 programme of the Central Electricity Board (which issued directions in September, 1943), includes one 22,500 m.c.r. turbo-alternator, two 180,000 lb per hr boilers, a natural-draught reinforced-concrete cooling tower, chimney and coal-handling plant at an estimated cost of £900,000. The second section, part of the C.E.B. 1948 programme (directed in November, 1944), will include a similar turbine, one boiler, and ash and flue-dust handling plant, costing £500,000. The turbine takes the place of two 15,000-kW units, and some existing low-pressure boilers have also been removed.



General view of the Valley power station

Steam conditions for the new chain-grate stoker-fired boilers are 650 lb per sq in. and 850 deg F. Temperature is automatically controlled by two attemperators between the two sections of the horizontal superheater. Two tubular two-section air preheaters, two forced- and two induced-draught fans and two secondary-air fans are provided for each boiler; the f.d. and i.d. fans are driven by 64–28 and 150–84 h.p. 400-V two-speed motors and fitted with vane control. The i.d. fans have integral grit arrestors fitted on the suction side. There is also a new 410-h.p. (6·6-kV) electrically driven feed-water pump with a capacity of 25,000 lb per hour.

Coal, after being discharged from railway wagons by a tippler, is taken by two belt conveyors (100 tons per hr) to a receiving bunker, from which it is transferred to the boiler-house bunkers by two bucket elevators. A low-pressure water-sluicing system carries the ash to an exterior sump (holding 190 tons) for transfer to overhead concrete bunkers, from which it is removed by road. Grit and flue dust are drawn from boiler and chimney hoppers to two 25-ton central containers and subsequently are taken thence, after mixing with water, to road vehicles.

The two-cylinder tandem 3,000-r.p.m. turbines have each two high-pressure and one low-pressure feed-water heaters, drain cooler, unit and quick-starting evaporators and two-stage air ejectors. The condensers are those previously used for superseded sets but modified by the removal of tubes to increase the steam lanes. Condensate is heated to 300 deg F before entering the continuous-loop steaming economizers. The first of the new alternators generates at 33 kV and weighs 117 tons; the second generates at 6·6 kV and weighs 89 tons.

The cooling tower (185 ft high) has a capacity of 1,250,000 gal. per hr and a pond 115 ft in internal diameter. Its weight, including pond and foundations, is 2,700 tons. Water enters at 27 ft above the sill level at about 84 deg F and is normally cooled to about 70 deg. Losses are made up from a well and the town's main. A new 780-h.p. (6·6-kV) circulating-water pump of 2,000,000 gal. per hr at 60-ft head supplements existing pumps. The chimney, 350 ft high and 22 ft in internal diameter at the top, incorporates offices in its base; the air-conditioning plant for the latter has a loading of 164 kW.

The output of the first alternator is controlled by a 33-kV metal-clad 800-A, 100-MVA oil circuit breaker forming an extension of the older switchgear, and the second by two 6·6-kV, 2,000-A, 500-MVA breakers. For the works power 6·6-kV, 600-A, 150-MVA oil-immersed metal-clad switchboards and 400-V 25-MVA

metal-clad (switch-fuse) and latched contactor gear have been provided, together with five 750-kVA 6·6-kV 400-V transformers. The new plant has been designed and constructed under the supervision of Mr. T. H. Carr, electrical engineer and manager.

Contractors for the extension include the following:—Boilers, stokers, economizers, steam and feed piping, Babcock & Wilcox; instrument panels, Bailey Meters; mechanical draught, James Howden & Co. (Land); fan motors, Lancashire Dynamo & Crypto; safety valves and steam traps, Hopkinsons; valve and fan control, James Tate & Co.; chimney, Tileman & Co.; air-conditioning, Davidson & Co.; cooling tower, Davenport Engineering Co.; turbo-alternators, C. A. Parsons & Co.; voltage regulator, Brown-Boveri & Co.; evaporator, Caird & Raynor; oil purifier, De Laval Co.; boiler-feed, c.w. pumps and fire-fighting, Mather & Platt; fire-fighting (switchroom), Pyrene Co.; 33-kV switchgear and works transformers, English Electric Co.; 6·6-kV and 400-V switchgear, A. Reyrolle & Co.; 400-V switchgear, Brookhirst Switchgear; high-voltage cables, British Insulated Callender's; medium-voltage cables, Pyrotenax; coal and ash handling, International Combustion; flue-dust handling, British Vacuum Cleaner & Engineering Co.; storage battery, Chloride Electrical Storage Co.

At the lunch which followed the inspection of the power station, Lord Citrine paid tribute to the pioneer work which had been done in Bradford. It had always been implicit in electrical legislation, he said, that final ownership should vest in the public, and two-thirds of the capacity of the industry was at present municipally owned. He and his colleagues would try to make the transition as smooth as possible. Co-operation, in the same spirit of public service which characterized the Bradford undertaking, would be the keynote.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1*s. each*) *may be obtained from the Patent Office*, 25, *Southampton Buildings, London, W.C.*2.

1942

NASH & Thompson, Ltd., A. G. Fraser-Nash, A. Whitaker and C. Fox.—"Scanning mechanism in which oscillating motion and rotatory motion are imparted to a member." 6360. May 11th, 1942. (592029.)

1943

Hazeltine Corporation.—"System for locating a radiated-signal reflector." 1837. March 3rd, 1942. (592030.)

G. Kent, Ltd., and J. A. M. Grout.—"Automatic control systems for generators of superheated steam." 16005. September 29th, 1943. (591942.)

Standard Telephones & Cables, Ltd.—"Electric coupling circuit." 17459. July 18th, 1942. (592031.)

1944

Parmeko, Ltd., L. T. Arman and P. R. Hutton-Penman.—"High speed signalling devices." 3. January 1st, 1944. (592032.)

Marconi's Wireless Telegraph Co., Ltd.—"Dipole antennas." 5932. February 23rd, 1943. (591987.)

Landis & Gyr Soc. Anon.—"Means for stabilizing the potential of control frequency currents imposed on consumers' networks." 11803. July 9th, 1943. (591897.)

British Insulated Cables, Ltd., J. C. Quayle, P. Jones and R. Bayles.—"Slitting of insulating material." 14086. July 24th, 1944. (591995.)

British Thomson-Houston Co., Ltd., and J. E. Stanworth.—"Glass compositions and articles made therewith." 14276. July 26th, 1944. (Cognate application 20586/44.) (592038.)

A. H. Walter.—"Thermostatically-controlled electric heating units." 14548. July 31st, 1944. (591997.)

Marconi's Wireless Telegraph Co., Ltd. (Radio Corporation of America).—"Pulse radio-frequency telegraph system." 14600. July 31st, 1944. (591898.)

M-O Valve Co., Ltd., and A. B. Sowter.—"Apparatus for use in making gold sealed joints." 14801. August 2nd, 1944. (592040.)

A. C. Cossor, Ltd., and C. E. Maitland.—"Manufacture of sealed electrical components." 15108. August 9th, 1944. (592041.)

Ges. zur Forderung der Forschung auf dem Gebiete der Technischen Physik an der Eidgenossischen Technischen Hochschule.—"Electronic - optical microchronometer." 15777. February 13th, 1943. (591900.)

Metropolitan-Vickers Electrical Co., Ltd., and A. Mandl.—"Fluorescent lighting systems." 16568. August 31st, 1944. (592042.)

Aktiebolaget Ljungströms Angturbin.—"Gas turbine systems." 17148. January 28th, 1944. (592081.)

S. P. Clementson.—"Electric heating systems." 18601. September 28th, 1944. (Cognate applications 24/45 and 1799/45.) (591947.)

English Electric Co., Ltd., and E. H. H. Hassler.—"Apparatus for the electrical welding of studs and the like." 18891. October 3rd, 1944. (Addition to 579711.) (592084.)

Foster Transformers & Switchgear, Ltd., and T. Courtney.—" Electric transformers." 20109. October 18th, 1944. (592003.)

British Thomson-Houston Co., Ltd., and J. E. Stanworth.—" Manufacture of electrical condensers." 20475. October 23rd, 1944. (592047.)

General Electric Co., Ltd., W. F. Baker and I. J. Pickering.—" Electrode holders for use in arc welding." 20491. October 23rd, 1944. (592004.)

Sunvic Controls, Ltd., and N. R. Davis.—" Electrical temperature regulating apparatus." 21590. November 3rd, 1944. (592006.)

F. B. Dehn (Trustees of the Mica Patents Trust).—" Composite bonded sheet insulating materials." 21973. November 8th, 1944. (591909.)

Bulpitt & Sons, Ltd., and F. Ashton.—" Electric heating elements." 24122. December 2nd, 1944. (592049.)

T. Diaz de Larraza y Segura.—" Electrically heated apparatus for applying steam and heated air for therapeutic, hygienic and beauty-treatment purposes." 25490. December 20th, 1943. (592012.)

H. Alfven and S. Eklund.—" Voltmeter for high voltages." 25867. December 24th, 1944. (591911.)

1945

J. Van Gelder and F. Jeanty.—" Electric warmers." 2319. January 30th, 1945. (591953.)

H. A. de Phillips.—" Electron discharge vessels." 2876. January 15th, 1944. (592015.)

Shardlow Electric Wires, Ltd., and L. S. Hargreaves.—" Apparatus for use in the manufacture of electric cables." 5291. March 2nd, 1945. (592060.)

General Electric Co., Ltd., and D. C. Espley.—" Switches for high-frequency electrical oscillations." 5661. March 7th, 1945. (Addition to 564988.) (592097.)

British Thomson-Houston Co., Ltd.—" Dimethyl silicone elastomers." 6294. March 14th, 1944. (592018.)

Plessey Co., Ltd.—" Direct current voltage changers." 6373. April 14th, 1944. (592062.)

Ferranti, Ltd., H. Wood, F. C. Williams and J. R. Whitehead.—" Super-regenerative radio receivers." 6604. March 15th, 1945. (591965.)

British Thomson-Houston Co., Ltd., K. J. R. Cocke, A. W. E. Hartley and R. I. Martin.—" Electric heater producing a jet of hot air or other gas." 6668. March 16th, 1945. (591966.)

Metropolitan-Vickers Electrical Co., Ltd., and H. W. Hardern.—" Magnetic ore structures for transformers and like induction electric apparatus." 7851. March 28th, 1945. (592020.)

Ace Electronics, Ltd., L. C. Welch and R. J. Cook.—" Two-way radio communication systems." 8431. April 5th, 1945. (591968.)

Compagnie de Produits Chimiques et Electrométallurgiques Alais, Froges et Camargue.—" Current lead-in device for carbon electrodes destined for electrolysis." 9013. September 24th, 1943. (592022.)

M-O Valve Co., Ltd., and G. W. Warren.—" Thermionic electric discharge tubes." 9088. April 11th, 1945. (592066.)

British Thomson-Houston Co., Ltd., A. Bowen and L. J. Till.—" Supports for cinematograph projectors." 10530. April 26th, 1945. (592067.)

National Carbon Co., Inc.—" Electrical contact brushes." 10928. April 29th, 1944. (592023.)

Allmanna Svenska Elektriska Aktiebolaget.—" Arrangement in pneumatically actuated gas blast electric circuit breakers." 11079. May 11th, 1944. (592024.)

Durham Cables, Ltd., and J. Allison.—" Trailing cables." 11148. May 2nd, 1945. (592025.)

Bendix Aviation Corporation.—" Electrical generators." 11161. October 9th, 1943. (591974.)

D. Karo.—" Electric clocks." 11288. May 3rd, 1945. (591924.)

Aga - Baltic Aktiebolag . — " Armature structure for electro-magnetic apparatus." 11368. May 12th, 1944. (591975.)

Standard Telephones & Cables, Ltd.—" Electric multi-channel pulse-type communication systems." 11452. June 12th, 1944. (591976.)

Standard Telephones & Cables, Ltd., and C. W. Earp.—" Electric phase measuring apparatus." 11986. May 12th, 1945. (591928.)

Telegraph Condenser Co., Ltd., P. A. Sporing and C. P. Johnson.—" Means for turning in the ends of metal tubes." 12533. May 18th, 1945. (592071.)

Morphy-Richards, Ltd., and F. G. Rutter.—" Suction cleaners." 12540. May 18th, 1945. (592072.)

Standard Telephones & Cables, Ltd., and J. R. Hunt.—" Bases for electron-discharge devices." 12601. May 18th, 1945. (592109.)

Londex, Ltd., and A. P. Besson.—" Electric light buoys and the like." 12674. May 19th, 1945. (592111.)

Thermega, Ltd., and S. A. Singleton.—" Casings for electrical devices." 17599. July 10th, 1945. (591931.)

Deep Power Station Lift

A 14-passenger high-speed electric lift which will give access to the next power station of the Kiewa hydro-electric project will have the longest vertical travel in Australia, namely, 465 ft. The lift will connect the control building above ground with the generating chamber hewn out of the solid rock 450 ft below the surface, two landings in the control building adding another 15 ft to the shaft. According to *Erda*, specifications of the State Electricity Commission of Victoria call for a lifting capacity of 2,000 lb at a top speed of 400 ft per min.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Bedfordshire. — October 18th. Education Committee. Electric lighting installation, etc., at Luton Technical College. (See this issue.)

Birmingham.—October 20th. Electric Supply Committee. Electric lighting equipment for railway sidings and roadways at Hams Hall "B" station. (See this issue.)

October 20th. Domestic electrical apparatus. (See this issue).

Plympton St. Mary.—October 17th. R.D.C. Domestic apparatus. (September 19th.)

Silsden.—September 30th. U.D.C. Gas Department. Electric lift at Gas Works. (September 12th.)

Slough.—October 6th. Corporation Waterworks Committee. Power and lighting cables and fittings at Datchet pumping station. Waterworks engineer, Town Hall.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aldershot.—Public library, High Street; borough engineer, Municipal Buildings.

Basford (Notts).—Houses for miners (937); R.D.C. surveyor, Rock House, Stockhill Lane.

Bingley.—Houses (30), Crack Lane, Wilsden, for U.D.C.; F. W. Heaton (Builders) Ltd., Airedale Mount, Sandybanks.

Border (Cumberland).—Houses (26), Cummersdale, for the R.D.C.; A. Hoodless & Son, builders, Durdar Road, Carlisle.

Bournemouth. — Stores, Richmond Hill (£100,000); Co-operative Society, Ltd.

Bradford.—Civic restaurant and kitchen, West Street and George Street; city architect, Town Hall.

Brookwood (Surrey).—Staff cottages (£44,500), Brookwood Mental Hospital; county architect, County Hall, Kingston-on-Thames.

Carlisle.—Block of 32 flats, Rydal Street, for Corporation; city architect, 18, Fisher Street.

Golborne.—Houses (66), Derby Road, for miners; U.D.C. surveyor, Newton Road, Lowton, Leigh, Lancs.

Helsby.—County school (£81,687), for Cheshire E.C.; Tysons, Ltd., Dryden Street, Liverpool.

Hexham.—Houses (28) for the U.D.C.; Bolton, Ltd., builders, Milbourne Crescent, Charlotte Street, Carlisle.

Huntingdon.—Permanent houses (32), on several sites; Parkinson & Doe, architects, Montague House.

Inverness.—Buildings for classrooms and kitchen, Montague Road (£25,000); A. Cullen, county architect, The Castle.

Jarrow.—Factory for J. R. Brown; Cussins (Contractors), Ltd., Gosforth, Northumberland.

Aluminium houses (50) for key workers; borough engineer.

Keswick.—Extensions, Southey Mills, Cumberland Pencil Co., Ltd. (£35,000); Hustle Rite Construction Co., 5, St. John's Street, Lancaster.

Kingsbury.—Church and hall, Roe Green; M. A. Farey, 83, Prince Albert Road, St. John's Wood, N.W.8.

Liverpool.—Canteen and kitchen, Rudston Road Primary School; W. Lothian, builder, 4, Broadgreen Road.

Rebuilding Emporium, Ranelagh Street, Lewis's, Ltd.; G. de C. Fraser, architect, 27, Dale Street.

Llanfynydd. — Villa for 50 beds at Pantglas Institution; W. T. Lloyd, county architect, Spilman Street, Carmarthen.

Manchester.—Works canteen, offices and garage, Textilose Road, Courtaulds, Ltd.; D. Walton & Co., Ltd., builders, Clarendon Road, Salford, 5.

Reinstatement of office and warehouse, Chorlton Street and Naylor Street, Edgar & Biggs; J. R. Gradwell, architect, 51, South King Street.

Merthyr Tydfil.—Aluminium houses (73), Pentrebach, and concrete houses (30), Galon Uchaf; borough surveyor.

Motherwell.—Houses (115) for Town Council; burgh surveyor.

Newark.—Pithead baths, Thoresby Colliery, Miners' Welfare Commission (£62,586); Greenwoods (Mansfield) Ltd., builders, 2, Wood Street, Mansfield.

Newcastle-on-Tyne.—Conversion of "Limecroft" into accommodation for the nursing staff at the General Hospital for the City Council; John Craven & Son, builders, 277, Two Ball Lonnen.

Newtownards (Co. Down).—Extensions to factories at airport for Ministry of Commerce.

North Riding.—Primary school at Kirbymoorside and houses (22) for the police force; J. Catchpole, county architect, County Hall, Northallerton.

Oakengates.—Aluminium bungalows (50), Priorslee; U.D.C. surveyor, Stafford Road.

Petersfield.—Houses (36), Uplands Road, Rowlands; R.D.C. Surveyor, College Street.

Rugby.—Permanent and "Airey" houses (38), Ryton-on-Dunsmore (£54,506), for R.D.C.; G. W. Deeley, Ltd., builders, 27, Avon Street, Upper Stoke, Coventry.

Ryton-on-Tyne.—Houses (28) on the Parkfield estate; U.D.C. surveyor.

Spennymoor.—Houses (72), Middlestone Moor; surveyor, Urban Council Offices.

Sunderland.—Additions, including new foundry, for the Wear Winch & Foundry Co., Ltd.; G. T. Brown & Son, architects, 51, Fawcett Street.

Houses for the T.C. Builders: T. Stewart (28); Gordon Bell, Ltd., (16); Stewart Bros., (18); Rutherford & Foster, (6); W. Milburn, (2); G. H. Plemper, Ltd., (12); C. Harrison (12).

Conversion of St. Paul's School, Hendon Street into ice-cream factory; G. T. Brown & Son, architects, 51, Fawcett Street.

Rebuilding factory for P. Bergson & Co., Bonnersfield; Stephenson & Gillis, architects, 2, Saville Place, Newcastle.

Wakefield.—Works canteen and extension to Laundry, Grantley Street; L. Holdsworth, architect, Sandal.

Wallasey.—Dining room and kitchen, Poulton Road Council School; Cartwright Bros. (Little Sutton), Ltd., builders, Dudleston Road, Little Sutton, near Chester.

Wallsend.—Factories on new trading estate for Lep Transport Co., and S. T. Taylor & Son, Ltd.; Matkin & Hawkins, architects, Fawcett Street, Sunderland.

Wandsworth.—Extensions to laboratories, Gargoyle Wharf, York Road; Vacuum Oil Co., Ltd., Caxton House, Westminster, S.W.1.

Wembley.—Block of flats, Forty Avenue; R. Atkinson, 13, Manchester Square, W.1.

Windermere.—Houses (34) Oldfield estate; Walker, Carter & Walker, Crescent Road.

Wrexham.—Dining room and kitchen, Cefn Mawr Council School Denbighshire E.C.; John Hughes, Ltd., 12a, Holt Street.

Electric Road Traction

More Goods Vehicles

THE Ministry of Transport has issued Return No. 136A (H.M. Stationery Office, 1s. 6d. net) containing the results of a census of vehicles for which licences were current in Great Britain during the third quarter of 1946 and giving the numbers of vehicles registered for the first time during the year ended December 31st, 1946.

It is shown that the total number of electric vehicles in service during the September quarter of last year was 7,888, as compared with 4,410 in 1938. Practically all of these were goods vehicles; there were nine "agricultural vans and lorries" (13 in 1938) and five "showmen's special vehicles" (against nil).

A total of 7,828 goods vehicles are analysed according to unladen weight and it is seen that the greatest number (3,857) fell between 12 cwt and 1 ton; there were 1,313 not over 12 cwt, 949 between 1 and 1¼ tons, and 116 over 5 tons.

There were 46 electrically propelled watering and cleansing vehicles owned by local authorities, against 57 in 1938, 12 being not over 1¼ tons and 15 between 3 and 4 tons unladen weight. Electrically propelled cars taxed on h.p. numbered 18, against only three in 1938, and there is mention of 13 electrically propelled bicycles.

Tramcars for which licences were current in the quarter under review numbered 6,120; there were 8,988 in 1938. On the other hand, the number of trolley vehicles in service rose from 2,725 in 1938 to 3,836 in the September quarter of 1946, but in spite of this the total number of vehicles of this class is seen to have fallen from 11,713 to 9,956.

In 1946 the following electrically operated vehicles were registered for the first time:—Agricultural vans and lorries, 4; goods vehicles, 1,316; cars, nil; bicycles, 4; trolley-buses, 87.

Atomic Power

Will Britain Lead America?

ACCORDING to the *Electrical World* "the completion of the first atomic pile in Great Britain is raising speculation in Washington that Britain may be getting industrial energy from nuclear fission before this country."

Our contemporary goes on to say that the coal shortage here has caused us to give more attention to the possibilities of atomic power than the United States which has subordinated this to the development of weapons of war. "British atomic research presumably is proceeding without help from the United States. Interchange of information on peaceful applications of atom-splitting is specifically forbidden by the McMahon Atomic Energy Act. However, during the war Britain had an atomic bomb program which was later absorbed in the Manhattan Project. And several British scientists worked on the U.S. bomb program."

Reference is then made to the low-power atomic pile which was put into service in August at Harwell and to the second, higher-powered pile scheduled for completion there next year which, it is said, may be comparable to the Oak Ridge experimental pile which produces the present U.S. supply of radio-isotopes. The third stage is the construction of a high-temperature pile at Drigg, capable of producing some 75,000 kW of usable power. In Canada the Chalk River plant is producing plutonium in minute quantities for experimental purposes. A larger pile for the production of radio-isotopes is believed to have been completed this year.